

AS180 Series Common Vector Inverter Instruction

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Chapter 1 Safety Notice

This section covers the safety notice and matters needing attention during use of AS180 inverter, including sign description, usage, arrival confirmation, transportation and storage, installation, wiring safety notice, commissioning/operation, fault overhaul and product disposal treatment etc. relating to safety. To ensure personal safety and lengthen the service life of equipment and its connecting device, please be sure to read the following safety rules and warnings as well as all warning marks attached to the equipment before installation and commissioning. Please carefully read this information.

1.1 Safety-related Sign

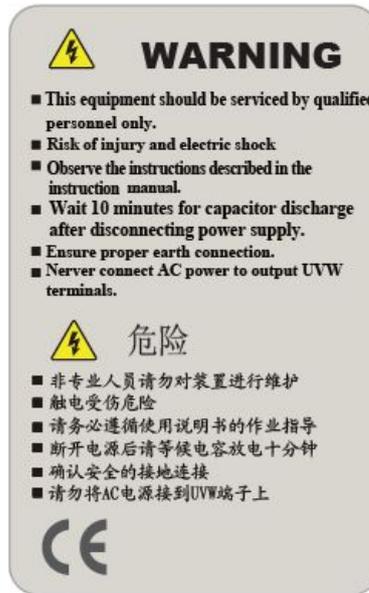
All safety related contents in this manual are marked following labels. All contents attached with these safety signs are important and must be followed strictly.

 **Danger** Indicates a hazardous situation, if a mistake operation could result in death or serious injury.

 **Notice** Indicates a hazardous situation, if a mistake operation could result in minor or severe injury and equipment trouble.

 **Important** Need to be followed and pay greater attention.

In addition, even if  **Notice** matters, according to the specific situation, sometimes also can lead to major accidents.



1.2 Safety Notes

1.2.1 Usage

Danger

This series inverter is used to control the operation of three-phase motor at variable speed, other than single-phase motor or other purposes, otherwise inverter fault or fire may be caused.

This series inverter can't be simply applied on the occasions directly related to personal safety, such as medical device.

This series inverter is produced under the strict quality management system. If any serious accident or loss may be caused by its fault, safety measures such as redundancy or bypass shall be provided.

1.2.2 Arrival Inspection

Notice

The product delivered must be in perfect condition and completely consistent with the information on the order form. If the product is damaged or inconsistent with the information on the order form, please contact your local distributor or agent or manufacturer.

If the equipment delivered has any damage or missing part, it shall not be installed or put into operation, otherwise it may cause accident.

1.2.3 Transportation and Storage

Notice

Avoid violent vibration or impact during transportation.

If any equipment damage is found, it must be informed to the transport company.

Equipment transportation and storage must satisfy the specified ambient conditions.

If the device is stored for more than 1 year, then the capacitor must be recharged.

1.2.4 Installation

Danger

Be careful of fire or electric shock.

Don't install the equipment in the flammable and combustible areas or those with water or corrosive danger.

Notice

Please hold the product bottom during handling and installation, to avoid crush or break the inverter.

Don't install the equipment in the areas which are easily affected by continuous vibration, shock or electromagnetic interference.

The inverter must be installed on the flame retardant object such as metal, and keep away from the flammable material or heat.

Be careful of fire! To ensure no foreign matters (sawdust, scrap iron, dust or paper scrap) inside the inverter or on its radiator.

A certain space must be provided between inverter and inverter, inverter and inner wall of another equipment/electrical cabinet. (Refer to Installation Location and Spacing for the details).

Horizontal installation is prohibited.

1.2.5 Electrical Wiring

Danger

Wiring must be executed by the qualified electrical engineering staff, otherwise electric shock or inverter damage may be caused.

Power supply must be disconnected prior to wiring, otherwise electric shock or fire may be caused.

Ground terminal PE must be reliably grounded, otherwise the inverter casing may be electrified.

Don't touch the main loop terminal, which shall not contact the casing, otherwise it may cause electric shock.

Turn on the power supply when the run signal is connected, then the motor will run automatically, then please confirm the power supply is connected after the run signal is disconnected. Otherwise personal injury may be caused.

For 3-wire system sequential control, wiring can be executed for the control loop after parameters of multifunctional input terminals are set, otherwise personal injury may be caused due to motor rotation.

1.2.6 Test Run

Notice

Be sure not to connect the power input cable to motor terminals U/T1, V/T2 and W/T3, nor motor cable to the power supply input terminals R/L1, S/L2 and T/L3.

Power line and signal line must be laid in different troughs, with minimum space 30cm between them. The cable connected can't touch any rotating mechanical part.

Capacitor or LC/RC noise filter with phase advance isn't permitted to connect to the output end of the inverter, otherwise internal components of the inverter may be damaged.

Wiring cable of the main loop terminal shall be provided with crimp terminals with insulating bush.

Selection of input and output cable of the inverter, choose the cable with proper section according to inverter power.

If the cable length between inverter and motor exceeds 100m or running with several motors, it suggests use output reactor, to avoid overcurrent due to too large capacitance distributed, so as to produce inverter fault.

Be sure not to use the load other than 3-phase AC motor.

Please ensure to take off the load when executing rotating self-learning. The motor will run and stop repeatedly before the self-learning is completed, therefore don't touch it, otherwise personal injury may be caused.

Danger

Please ensure to turn on the power supply after the front outer cover has been installed. Don't remove the outer cover when the power supply is turned on, otherwise electric shock may be caused.

Please prepare the emergency stop switch additionally (stop button is effective only when function setting is executed).

Please ensure reset alarm after run signal is switched off, otherwise personal injury may be caused.

 **Notice**

Be sure to have motor no-load commissioning first, and then motor load commissioning. Don't touch the radiator, motor or other high temperature part when the equipment is running or within a period of time after the equipment is disconnected, to avoid scald.

Don't start or stop the inverter by means of connecting or disconnecting the power supply repeatedly, otherwise it will damage the equipment/system.

Prior to running, please ensure that the motor and machine are within the permissible range of application, otherwise equipment damage may be caused.

When it is used with the lifting equipment, mechanical brake device will be provided at the same time.

Don't change the inverter parameters at will, most of the factory set parameters of the inverter are able to satisfy the running requirement, only to set some necessary ones. Random modification may cause mechanical damage.

1.2.7 Maintenance and Inspection

 **Danger**

There are HV terminals in the inverter, don't touch them randomly, otherwise electric shock may be caused.

Be sure to install the protective cover when the equipment is electrified. In addition, when remove the protective cover, be sure to disconnect the circuit breaker for wiring, otherwise electric shock may be caused.

After power supply of the main loop is cut off, please wait for 10 min at least, then execute maintenance and inspection only after the charge indicator of the outer cover went off, otherwise electric shock may be caused due to the residual voltage on the capacitor.

Except for the appointed staff, don't execute maintenance, inspection or replacement operation by others. Prior to these operations, please take off the metal ornaments (watch, ring, etc). During operation, please use the tools treated with insulation, otherwise electric shock may be cause.

 **Notice**

Don't touch the circuit board because there is CMOS large scale integrated circuit,

to avoid damage to the board.

1.2.8 Disposal Treatment

Danger

Explosion may be caused when electrolytic capacitor of the main loop and that on the printed board is burning. Poisonous gas may be produced when plastic parts are burning. Disposal of the equipment must be based on the laws and regulations on processing the industrial electronic waste of the related environmental protection department.

1.2.9 Accord with Low Voltage Directive

Danger

Our products meet the standard of EN61800-5-1:2007, thus they are in accord with “Low Voltage Directive 2006/95/EC”.

Make sure that the whole system meets EC requirement if this inverter is integrated in the whole electrical system as a component.

Please note:

- ① To ensure that machine is grounded, and the ground terminal block is grounded separately
- ② Prohibit to ground inverter at Δ , and use IT power
- ③ To ensure that the cabinet is grounded if inverter is installed in it
- ④ Use CE certified breaker, electromagnetic contactor and other components. Type B leakage current circuit breaker is required

The protection level of this inverter is class 1. And please use it under the conditions as overvoltage Catalogue III. 3, and pollution Degree II.

1.2.10 Others

Notice

Don't place the inverter in the environment containing halogen (F, Cl, Br and I) under any circumstances of transportation or setting, otherwise inverter damage or parts burning may be caused.

1.3 Matters Needing Attention

1.3.1 Motor Insulation Inspection

The motor shall be executed with insulation inspection when it is used for the first time, reused after long time storage or regular inspection, to avoid inverter damage due to insulation failure of motor winding. During insulation inspection, be sure to separate the motor wiring from the inverter, 500V megameter is recommended. Insulation resistance measured shall be below 5 MΩ.

1.3.2 Thermal Protection of the Motor

If the chosen motor doesn't match with the rated capacity of AS180 series inverter, especially rated power of the inverter is greater than that of the motor, please adjust the related motor protection parameters of AS180 or install a thermal relay in front of the motor, to protect the motor.

1.3.3 Heating and Noise of the Motor

The output voltage of the inverter is PWM wave, with a certain harmonic, therefore temperature rise, noise and vibration of the motor are slighted increased comparing to power frequency running.

When the ordinary motor runs at a low speed for a long time driven by the inverter, its cooling effect becomes poor, and its temperature will rise. If it needs to run at a low speed and constant torque for a long time, variable frequency motor must be chosen or forced air cooling shall be adopted.

1.3.4 Notices for Input and Output

The output of AS180 is PWM wave, if capacitor to improve power factor or voltage dependent resistor for lightning protection is installed on the output side, instant overcurrent or damage will be caused to the inverter. Don't use it.

Schematic diagram shows that output side of inverter can not connect capacitor. See Fig. 1-1.

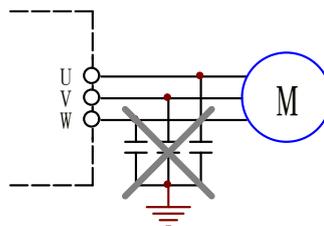


Fig. 1-1 Capacitor cannot be connected to the output of inverter

If a contactor is provided between the power supply and input end of the inverter, then it is prohibited to control start or stop of the inverter with this contactor.

If the switching elements such as contactor are provided between the output end and the motor, it shall ensure the inverter to have making-breaking operation without any output. The contactor won't be closed when the inverter is outputting, otherwise module damage is easily produced.

Start and stop of the inverter can be controlled by the terminal. Direct and frequent start and stop with the use of switching elements such as contactor on the input side of the inverter will be prohibited, otherwise equipment damage may be caused.

1.3.5 Use Beyond the Rated Voltage Value

If AS180 series inverter is used when the external voltage isn't within the permissible operating voltage scope specified in this manual, damage to the inverter components may be caused. If necessary, please use the related boosting or dropping device to have voltage change processing.

1.3.6 Lightning Surge Protection

This series inverter is provided with lightning surge protective device, with certain self-protection ability to the inductive thunder. The customer shall provide protection in front of the inverter at the places with frequent lightning.

1.3.7 Leakage Protection

High speed switch will work when the inverter is running, leading to high frequency leakage current, which will cause malfunction of the leakage protection circuit sometimes. When the above problem occurs, a leakage protector shall be correctly installed, besides carrier frequency reduction or lead shortening.

The followings must be noted during installation of the leakage protection circuit:

- Leakage protector must be set on the input side of the inverter, it is suitable to put it behind the air switch (non-fuse circuit breaker).
- Leakage protector shall adopt that not sensitive to higher harmonic or that dedicated to the inverter (sensitivity: 30mA above). If the ordinary leakage protector is applied, whose sensitivity shall be better than 200mA and actuation time shall be above 0.1s.

1.3.8 Use of Decreasing

When the ambient temperature exceeds 40°C, the inverter shall be decreased by 2% for temperature rise of every 1°C. And external forced cooling must be added.

In the areas where the altitude is greater than 1000m, cooling effect of the inverter will become poor due to thin air, the inverter shall be decreased by 1% for altitude rise of every 100m, the maximum altitude is 3000m;

When the carrier frequency set exceeds the factor setting, the inverter shall be decreased by 10% for frequency increase of every 1 kHz;

Please refer to our company for the details of decreasing.

1.3.9 Adaptive Motor

AC asynchronous motor is suitable for the inverter, please be sure to choose the inverter according to motor nameplate.

Built-in default motor parameters of the inverter are asynchronous motor ones, but necessary motor parameter identification or default value modification shall be made according to the actual situation, to meet the actual value, otherwise operation effect and protective performance may be affected.

If short circuit appears inside the cable or the motor, the inverter will send an alarm or even be damaged, therefore insulation short circuit testing shall be made for the motor and cable initially installed, as well as during the daily maintenance. Please note that the inverter and the part to be tested must be disconnected completely during testing.

Chapter 2 Product Overview

AS180 series is 400V (380V~460V) common vector inverter, and applies to 3-phase AC asynchronous motor with motor capacity 2.2~355kW. AS180 series inverter with factory default set provides the ideal solution for many simple motor control applications, it is also can be applied to more advanced motor control operation after the related parameters are set.

2.1 Nameplate Description

The nameplate is attached to the side of the inverter, with the model, specification, batch No. and manufacturing code, etc on it.

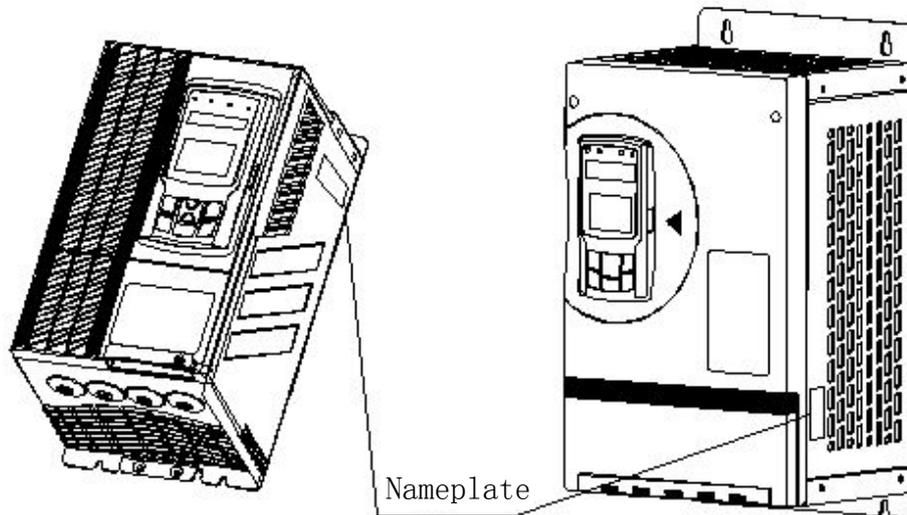


Fig. 2-1 Inverter Nameplate (example)

2.1.1 Description of Inverter Nameplate

Inverter nameplate, see Fig.2-2. Nameplate records the model, specification and lot number.

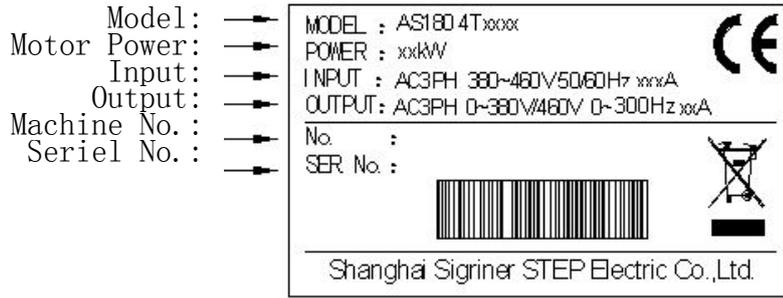


Fig. 2-2 The description of the inverter nameplate

2.1.2 Product (order No.) Description

In the column “inverter model” on the nameplate, specification, voltage grade, motor type and maximum power of the inverter are expressed in letters and numbers.

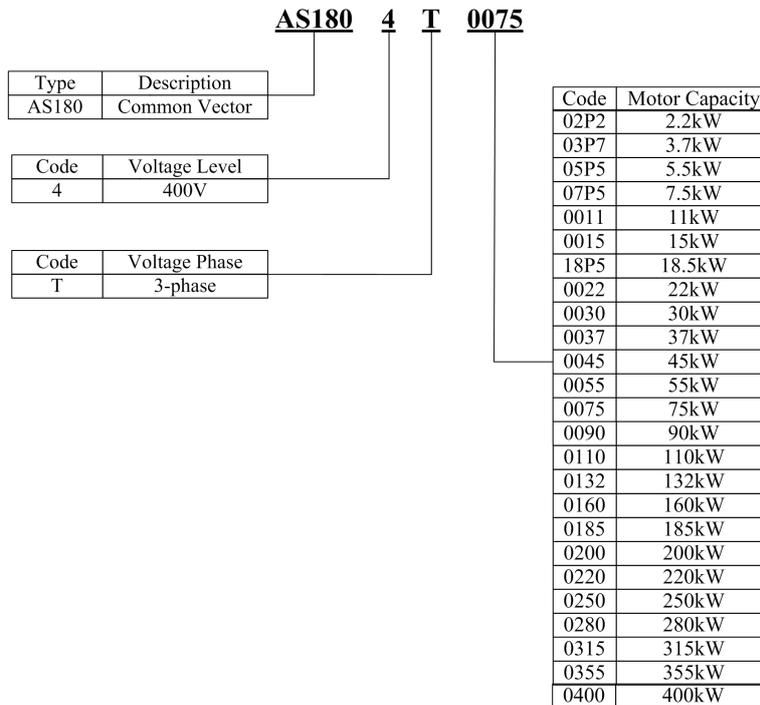


Fig. 2-3 Description of inverter model

2.1.3 Description of Product Specification

In the column “inverter specification” on the nameplate, voltage level and rated current value of the inverter are expressed in letters and numbers.

Table 2.1 Inverter Specification Series

Stable operation at 40°C, heavy load

Inverter model AS180	Rated input current (A)	Rated output current (A)	Adaptative motor (kW)	Overload 150% (1min)
4T02P2	5.3	5	2.2	6
4T03P7	7.5	7	3.7	8.4
4T05P5	11.5	11	5.5	13.2
4T07P5	16	15	7.5	18
4T0011	21	20	11	24
4T0015	30.5	29	15	34.8
4T18P5	38	36	18.5	43.2
4T0022	46	44	22	52.8
4T0030	59	56	30	67.2
4T0037	75	72	37	86.4
4T0045	94	90	45	108
4T0055	115	110	55	132
4T0075	154	148	75	177.6
4T0090	183	176	90	211.2
4T0110	216	208	110	249.6
4T0132	261	252	132	302.4
4T0160	306	296	160	355.2
4T0185	367	356	185	427.2
4T0200	402	390	200	468
4T0220	427	415	220	498
4T0250	481	468	250	561.6
4T0280	533	520	280	624
4T0315	614	600	315	720
4T0355	664	650	355	780
4T0400	755	740	400	888

- Notes:** 1. The maximum power of adaptative motor is the rated power of 4-pole 50Hz standard motor. During the actual application, nameplate of the motor must be examined, to ensure the inverter selected is match with the motor.
2. The above is the rated current under default carrier frequency, $\leq 15\text{kW}$, carrier frequency 6kHz; $< 30\text{kW}$, carrier frequency 5kHz, $\leq 55\text{kW}$, carrier frequency 4kHz; $\leq 75\text{kW}$, carrier frequency 3kHz; $> 75\text{kW}$, carrier frequency 2kHz.

2.2 Technical Indicator and Specification of Inverter

Power input	Input voltage	380V ~ 460V (-15% ~ +10%), 3-phase power supply
	Input frequency	45 ~ 65Hz
	Permissible voltage	Voltage unbalance < 3%

	variation	
	Current harmonic	Built-in DC reactor for 37kW and above, with current harmonic <40% (full load) Externally installed DC reactor for 37kW and below (optional)
	Transient voltage sag	3-phase AC380V ~ 460V, input voltage<AC300V, under-voltage protection 15ms later.

Power output	Voltage	0VAC ~ input voltage
	Output frequency	V/F control: 0.00 ~ 300.00Hz
	Overload grade	Stable operation under 40°C, light load 120%, 1min
	Efficiency (full load)	≥0.94
	Output frequency precision	±0.01% (digital command-10 ~ +45°C) ±0.1% (analog command 25±10°C)

Digital I/O	Optoelectronic isolated input	7 optoelectronic isolated inputs, 24V, either high or low level is effective, which is settable. Input functions can be defined.
	Open collector output	2 open collector outputs, output functions can be defined
	Relay output	2 relay outputs with normally open contact, contact capacity: inductive, 1.5A/250VAC, output functions can be defined. 2 relay outputs with normally open and close double contact, contact capacity: resistive, 4.5A/250VAC or 4.5A/30VDC; inductive: 0.4A/250VAC or 0.4A/30VDC; output functions can be defined.

Analog I/O	Analog input	2 analog inputs, precision 0.1%: Voltage: -10V ~ +10VDC or current: 0~20mA optional signal
	Analog output	2 analog outputs, precision 0.1%: Voltage: -10V ~ +10VDC or current: 0~20mA optional signal

Encoder input	PG power	5V, 12V, 300mA
	PG signal	Open collector, push-pull, differential, SIN/COS increment type, Endat absolute value type and Resolver type
	PG frequency dividing output	Quadrature open collector output, frequency dividing factor 2/4/8/16/32/64/128 is settable (optional)

Control characteristics	Control mode	V/F control	Open loop vector control
	Starting torque	2.50Hz, 150%	0.5Hz, 150%
	Speed regulation range	1:50	1:200
	Speed stabilizing precision	± 2%	± 0.2%
	Carrier frequency	1.1~8kHz; automatically adjust the carrier frequency according to load characteristic	

	Frequency set resolution	0.01Hz (digital command) ±0.06Hz/120Hz (analog command 11 bit + unsigned)
	Run command channel	Operation panel reference, control terminal reference and communication reference
	Frequency reference channel	Operation panel reference, digital/analog reference, communication reference and functional function reference
	Torque lifting	Automatic and manual torque lifting
	V/F curve	The user defines V/F curve, linear V/F curve and 3 reduced torque characteristic curves.
	Automatic voltage regulation	Automatically regulate the duty cycle of output PWM signal according to fluctuation of bus voltage, so as to relieve the influence of the voltage fluctuation of grid on the output voltage fluctuation.
	Continuous operation under transient outage	Realize continuous operation by controlling the bus voltage during instantaneous power failure.
	Dynamic braking capacity	Built-in braking unit for 30kW and below, with braking resistor externally (optional) Externally installed braking unit for 30kW and above (optional)
	DC braking capacity	Braking current: 0.0 ~ 100.0% rated current

Special functions	Parameter copy	The standard operation panel could upload, download the parameters, and indicate copy progress.
	Process PID	Closed loop control for quantity of process.
	Common DC bus	Realize the common DC bus power supply for several inverters

Motor protection	Blocked rotor
	Motor overload
	Motor overheat (PTC)
	Speed limitation
	Torque limitation

Inverter protection	Output current amplitude limiting
	Inverter overload
	IGBT I ² t overload
	Input power undervoltage/overvoltage
	DC bus undervoltage/overvoltage
	IGBT overheat
	Radiator overheat
	Power failure
	Analog input signal loss (speed reference value loss)
	Abnormal communication
	Self-tuning failure

Ambient conditions	Place of service	Vertically installed inside the electrical control cubicle with good ventilation. Horizontal or other installation is not permitted. Cooling medium is air. It is installed in the environment free from direct sunshine, dust, corrosive gas, combustible gas, oily mist, steam and dripping water.
	Ambient temperature	-10 ~ +40°C
	Temperature derating use	>40°C, the rated output current decreases by 2% if the temperature increases every 1°C (maximum 50°C)
	Altitude	<1000m
	Altitude derating use	>1000m, the rated output current decreases by 1% if the altitude increases every 100m (maximum 3000m)
	Ambient humidity	5 ~ 95%, without condensation
	Vibration (transportation)	$2 \leq f < 9\text{Hz}$ 3.5mm; $9 \leq f < 200\text{Hz}$, 10 m/s ² ; $200 \leq f < 500\text{Hz}$, 15 m/s ²
	Vibration (installation)	$2 \leq f < 9$ 0.3mm; $9 \leq f < 200\text{Hz}$, 1m/s ²
	Storage temperature	-40 ~ +70°C
	Protection degree	IP20

Control panel	Type	Movable
	Length	1m (it can be customized, maximum 5m)
	Connection	RJ45
	Text display	4 lines
	LED display	4-bit
	Visual LED indicator	4
	Key	9

Others	Cooling mode	Forced air cooling
	Installation way	Inside the cubicle
	Certification	CE

2.3 Installation Simensions of the Inverter

2.3.1 Product Appearance and Name of each Part

Refer to Fig. 2-4, Fig. 2-5 and Fig. 2-6 for appearance of the inverter and name of each part.

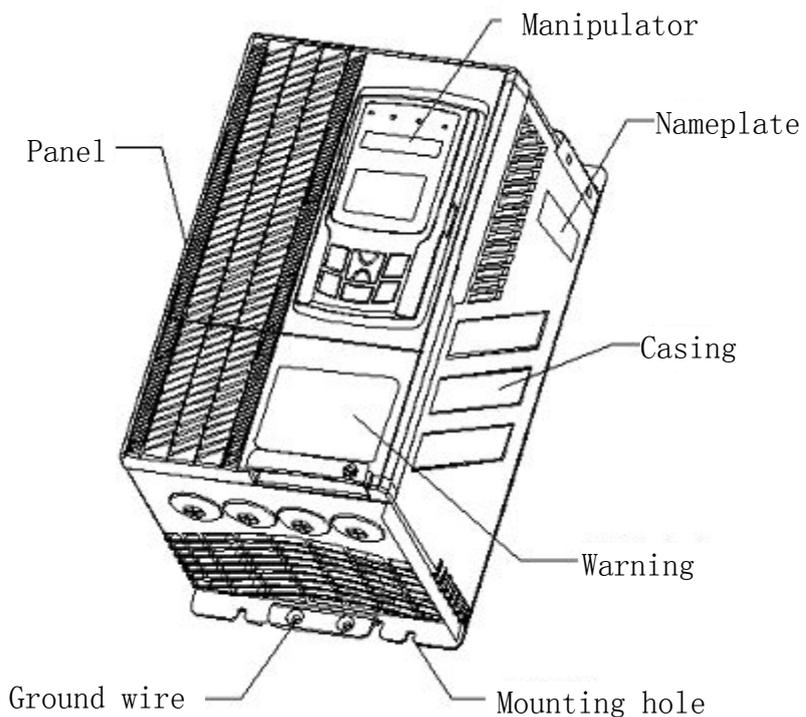


Fig. 2-4 AS180 4T05P5 and below

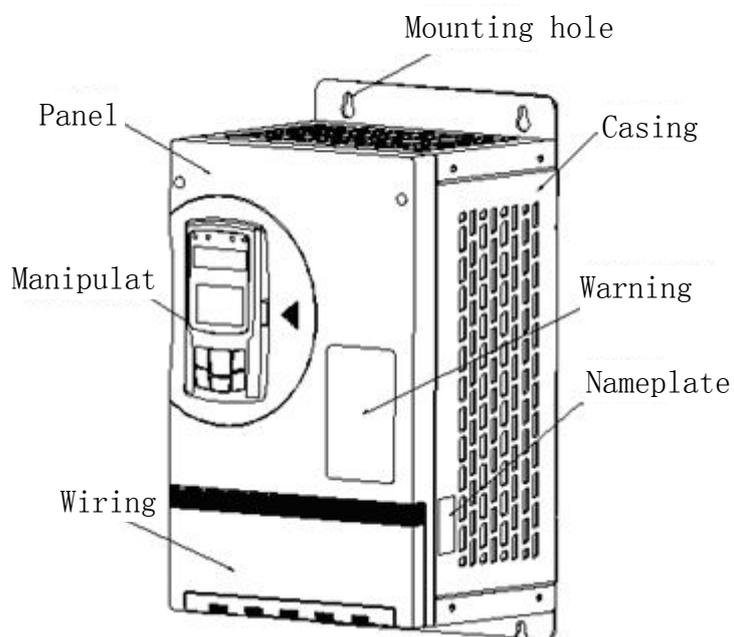


Fig. 2-5 AS180 4T07P5-4T0022 power level

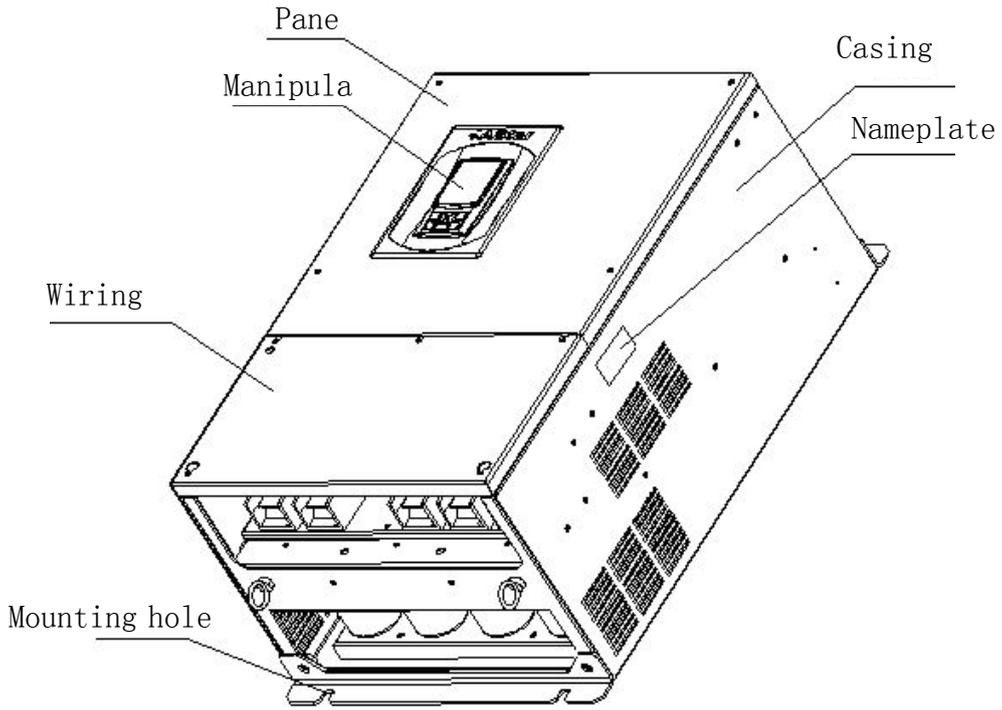


Fig. 2-6 AS180 4T0030~4T0355 power level

2.3.2 Product Boundary Dimension and Mounting Dimension

2.3.2.1 A1 Specification and Dimension

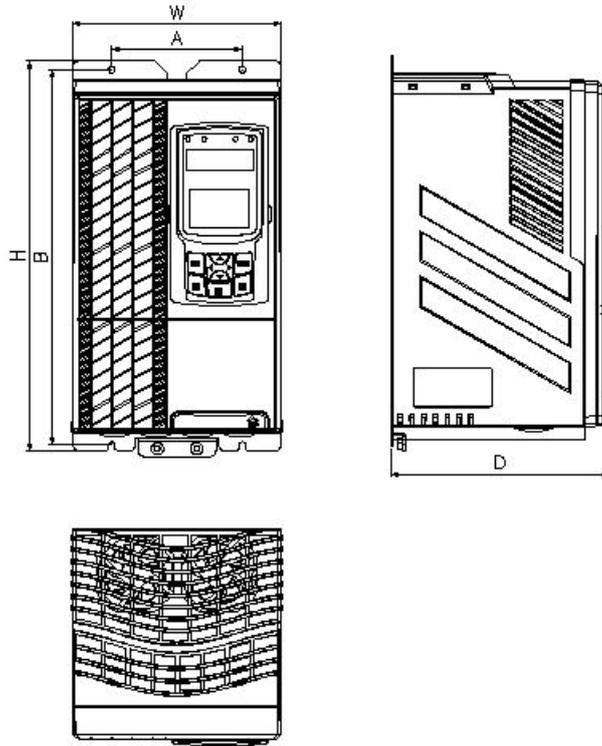


Fig. 2-7 Installation dimensions of AS180 4T01P1~4T05P5

Specifications	Model AS180	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Installing Diameter Φ(mm)	Installation			Tightening torque (Nm)	Weight (kg)
								Bolt	Nut	Washer		
1	4T02P2	100	288.5	300	160	162	5.0	4M4	4M4	4Φ4	1.1	4.5
	4T03P7											
	4T05P5											
	4T07P5											

2.3.2.2 A2~A8 Specification and Dimension

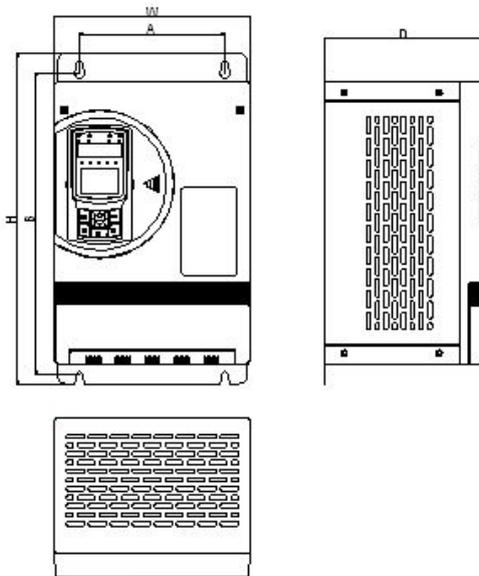


Fig. 2-8 Installation dimensions of AS180 4T07P5~4T0022

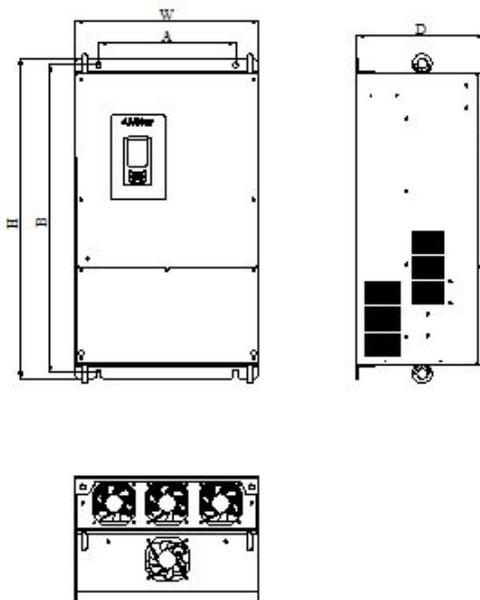


Fig. 2-9 Installation dimensions of AS180 4T0030~4T0355

Specifications	Model AS180	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Installing Diameter Φ(mm)	Installation			Tightening torque (Nm)	Weight (kg)
								Bolt	Nut	Washer		
A2	4T0011	165.5	357	379	222	182	7.0	4M6	4M6	4Φ6	3.5	8
	4T0015											
A3	4T18P5	165.5	392	414	232	182	7.0	4M6	4M6	4Φ6	3.5	10.3
	4T0022											
	4T0030											
A4	4T0037	200	512	530	330	288	9.0	4M8	4M8	4Φ8	9	29.5
	4T0045											
A5	4T0055	200	585	610	330	310	9.0	4M8	4M8	4Φ8	9	38
	4T0075											
A6	4T0090	320	718	750	430	350	13.0	4M12	4M12	4Φ12	29	79.5
	4T0110		768	800								81
	4T0132											
A7	4T0160	374	844	880	500	352	13.0	4M12	4M12	4Φ12	29	106.5
	4T0185											
	4T0200											112.5
	4T0220											
	4T0250											
A8	4T0280	500	997	1030	630	370	14.0	4M12	4M12	4Φ12	29	168
	4T0315											169
	4T0355											
	4T0400											

2.3.3 Operator Dimension

Fig. 2-10 shows the dimensions of the operator.

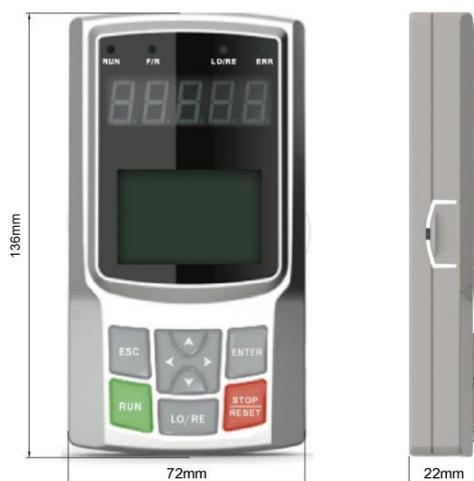


Fig. 2-10 The dimension of the inverter Operator

2.4 Selection of Braking Unit and Braking Resistor

Negative torque may appear when the motor is running under braking. Therefore braking component will be considered for the inverter, otherwise overcurrent or overvoltage will occur, leading to tripping. AS180 series inverter with 30kW and below is provided with built-in braking unit, only braking resistor externally provided; while 30kW and above is the externally installed braking unit, it is recommended to choose the optional braking unit and braking resistor, whose specification and quantity will be different based on the different ratio occupied by braking time within a braking period.

When braking time occupied within a braking period is 10%, configuration of the externally installed braking unit and braking resistor is shown as Table 2-2.

Table 2-2 Configuration table for 400V braking unit and braking resistor

Inverter model	Inverter capacity (kW)	Braking unit		Braking resistor (Utilization rate 10%)	
		Specification	Qty. (pcs)	Specification of equivalent braking resistor	Qty. (pcs)
AS180					
4T02P2	2.2	Built-in		260W 400Ω	1
4T03P7	3.7			260W 250Ω	1
4T05P5	5.5			390W 150Ω	1
4T07P5	7.5			520W 100Ω	1
4T0011	11			780W 75Ω	1
4T0015	15			1040W 50Ω	1
4T18P5	18.5			1560W 40Ω	1
4T0022	22			4800W 32Ω	1
4T0030	30			4800W 27.2Ω	1
4T0037	37			BKU-4030	1

Inverter model AS180	Inverter capacity (kW)	Braking unit		Braking resistor (Utilization rate 10%)	
		Specification	Qty. (pcs)	Specification of equivalent braking resistor	Qty. (pcs)
4T0045	45	BKU-4045	1	9600W 16Ω	1
4T0055	55	BKU-4045	1	9600W 13.6Ω	1
4T0075	75	BKU-4030	2	6000W 20Ω	2
4T0090	90	BKU-4045	2	9600W 13.6Ω	2
4T0110	110	BKU-4110	1	18kW 6.7Ω	1
4T0132	132	BKU-4110	1	25kW 5Ω	1
4T0160	160	BKU-4220	1	40kW 3.4Ω	1
4T0185	185	BKU-4220	1	40kW 3.4Ω	1
4T0200	200	BKU-4220	1	40kW 3.4Ω	1
4T0220	220	BKU-4220	1	48kW 3Ω	1
4T0250	250	BKU-4220	1	48kW 3Ω	1
4T0280	280	BKU-4110	2	25kW 5Ω	2
4T0315	315	BKU-4220	2	40kW 3.4Ω	2
4T0355	355	BKU-4220	2	40kW 3.4Ω	2
4T0400	400	BKU-4220	2	40kW 3.4Ω	2

When braking time occupied within a braking period is 20%, configuration of the externally installed braking unit and braking resistor is shown as Table 2-3.

Table 2-3 Configuration table for 400V braking unit and braking resistor

Inverter model AS180	Inverter capacity (kW)	Braking unit		Braking resistor (Utilization rate 20%)	
		Specification	Qty. (pcs)	Specification of equivalent braking resistor	Qty. (pcs)
4T02P2	2.2	Built-in		520W 350Ω	1
4T03P7	3.7			520W 230Ω	1
4T05P5	5.5			780W 140Ω	1
4T07P5	7.5			1040W 90Ω	1
4T0011	11			1560W 70Ω	1
4T0015	15			2kW 47Ω	1
4T18P5	18.5			3kW 34Ω	1
4T0022	22			9600W 28Ω	1
4T0030	30			9600W 24Ω	1
4T0037	37	BKU-4045	1	12.5kW 17Ω	1
4T0045	45	BKU-4045	1	20kW 15Ω	1
4T0055	55	BKU-4030	2	10kW 24Ω	2
4T0075	75	BKU-4045	2	12.5kW 18Ω	2
4T0090	90	BKU-4110	1	36kW 6.7Ω	1

Inverter model AS180	Inverter capacity (kW)	Braking unit		Braking resistor (Utilization rate 20%)	
		Specification	Qty. (pcs)	Specification of equivalent braking resistor	Qty. (pcs)
4T0110	110	BKU-4045	3	12.5kW 18Ω	3
4T0132	132	BKU-4045	3	12.5kW 16Ω	3
4T0160	160	BKU-4220	1	80kW 3.5Ω	1
4T0185	185	BKU-4220	1	80kW 3.2Ω	1
4T0200	200	BKU-4110	2	50kW 5Ω	2
4T0220	220	BKU-4110	2	50kW 5Ω	2
4T0250	250	BKU-4110	2	50kW 5Ω	2
4T0280	280	BKU-4220	2	60kW 4.7Ω	2
4T0315	315	BKU-4220	2	80kW 3.5Ω	2
4T0355	355	BKU-4220	2	80kW 3.5Ω	2
4T0400	400	BKU-4220	2	80kW 3.5Ω	2

When braking time occupied within a braking period is 40%, configuration of the externally installed braking unit and braking resistor is shown as Table 2-4.

Table 2-4 Configuration table for 400V braking unit and braking resistor

Inverter model AS180	Inverter capacity (kW)	Braking unit		Braking resistor (Utilization rate 40%)	
		Specification	Qty. (pcs)	Specification of equivalent braking resistor	Qty. (pcs)
4T02P2	2.2	Built-in		800W 275Ω	1
4T03P7	3.7			1.3kW 180Ω	1
4T05P5	5.5			2.2kW 110Ω	1
4T07P5	7.5			3.3kW 75Ω	1
4T0011	11			4.5kW 55Ω	1
4T0015	15			6.6kW 37Ω	1
4T18P5	18.5			9kW 27Ω	1
4T0022	22			11kW 22Ω	1
4T0030	30			13kW 18Ω	1
4T0037	37			BKU-4045	1
4T0045	45	BKU-4030	2	12.5kW 22Ω	2
4T0055	55	BKU-4045	2	12.5kW 18Ω	2
4T0075	75	BKU-4045	2	20kW 15Ω	2
4T0090	90	BKU-4110	1	60kW 5Ω	1
4T0110	110	BKU-4110	1	60kW 5Ω	1
4T0132	132	BKU-4220	1	70kW 3.7Ω	1
4T0160	160	BKU-4220	1	70kW 3.7Ω	1
4T0185	185	BKU-4220	1	90kW 3Ω	1

Inverter model AS180	Inverter capacity (kW)	Braking unit		Braking resistor (Utilization rate 40%)	
		Specification	Qty. (pcs)	Specification of equivalent braking resistor	Qty. (pcs)
4T0200	200	BKU-4220	2	60kW 5Ω	2
4T0220	220	BKU-4220	2	60kW 5Ω	2
4T0250	250	BKU-4220	2	70kW 3.7Ω	2
4T0280	280	BKU-4220	2	70kW 3.7Ω	2
4T0315	315	BKU-4220	2	90kW 3Ω	2
4T0355	355	BKU-4220	2	90kW 3Ω	2
4T0400	400	BKU-4220	2	90kW 3Ω	2

Chapter 3 Installation of the Inverter

3.1 Installation Steps

Step 1: delivery of the inverter

- Examine and confirm the catalog number on the label is the same as that on the order form
- Remove the packing of AS180 inverter and examine it for any damage during transportation

Step 2: examine the line voltage

- Examine and confirm that the line voltage is matched with voltage and frequency range of the inverter

Step 3: install the inverter

- Install the inverter as described in this document
- Install any internal and external option

Step 4: wiring of the inverter

- Connect the motor and ensure the voltage is consistent with the inverter
- Connect the control line
- Connect the speed reference
- Connect the communication cable
- Connect the encoder cable
- Connect the power line after power is turned off

3.2 Mechanical Installation

3.2.1 Installation Environment of the Product

3.2.1.1 Temperature and Humidity

Operating ambient temperature is $-10^{\circ}\text{C} \sim 40^{\circ}\text{C}$. Derating when the ambient temperature exceeds 40°C (maximum 50°C). For the ambient temperature greater than 40°C , derating by 2% for every increase of 1°C . Relative humidity of the air is $\leq 95\%$, without condensation.

For the occasions with poor environment on site, it is recommended to enhance the cooling of the inverter.

3.2.1.2 Altitude

In altitude below 1000m area, the inverter can operating under rated power. Derating when the installation altitude over 1000m area (maximum 3000m). Fig. 3-1 shows the relationship between descendent rated output current and the altitude.

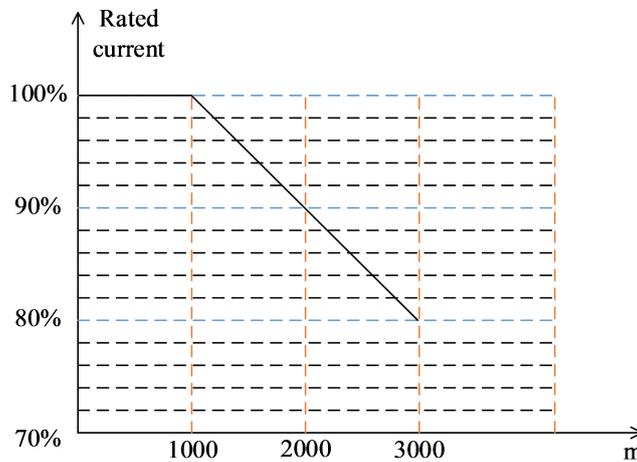


Fig. 3-1 Diagram of rated output current vs. altitude

3.2.1.3 Other Environmental Requirements

- Avoid installation in the places with violent vibration or shock, the maximum vibration acceleration not greater than 5.8m/s^2 (0.6g).
- Don't install it in the places with electromagnetic radiation point.
- Avoid installation in the places with oil mist, metal dust and more dust.
- Avoid installation in the places with poisonous and harmful gas, liquid, corrosive gas, flammable and explosive gas.
- Avoid installation in the places containing more salt content.
- Be sure not to install it in the place with direct sunshine.
- Be sure not to install it on the flammable object such as wood.
- Be sure not to drop any boring residue inside the inverter during installation.

3.2.2 Installation Position and Space Requirement


Danger

According to the installation method chosen, the inverter must be vertically installed:

- inside the electrical cabinet

Horizontal installation in the electrical cabinet will be prohibited.

3.2.2.1 Installation Orientation

In order not to reduce the cooling effect of the inverter, it shall be installed in the place with good ventilation, with vertical installation direction.

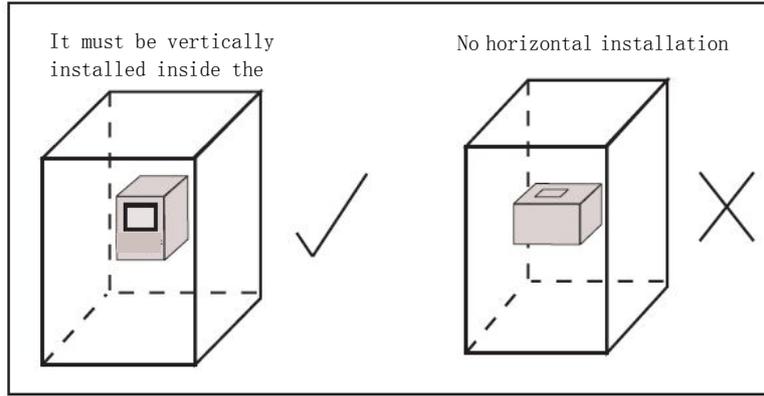


Fig. 3-2 Installation orientation

When the user vertically installs the inverter, the included angle between it and the horizontal plane will be 87° to 90° . The details are shown as Fig. 3-3:

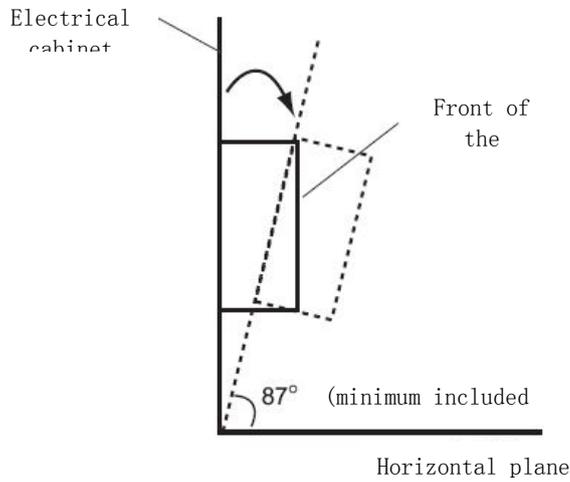


Fig. 3-3 Permissible installation included angle

3.2.2.2 Installation Space

Several inverters may be installed side by side or up and down, space among inverters as well as that between the inverter and the electrical cabinet wall shall be:

Refer to Fig. 3-4(a) for the installation space of the inverter 37kW and below.

Refer to Fig. 3-4(b) for the installation space of the inverter 45kW and above.

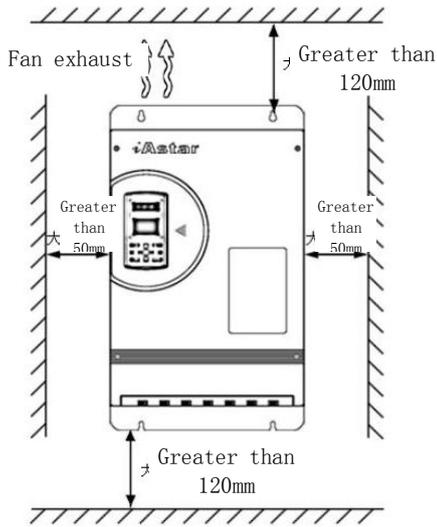


Figure 3-4(a) Installation space schematic of the inverter (37kW and below)

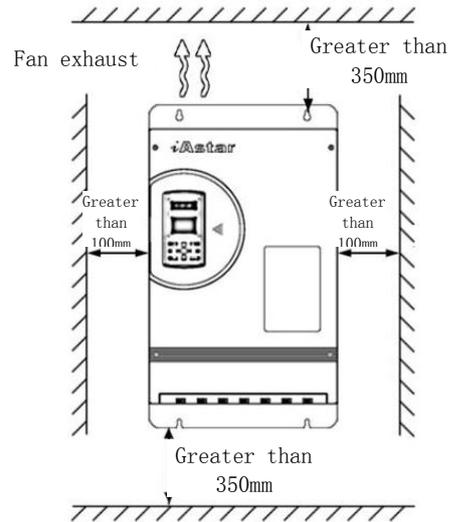


Figure 3-4(b) Installation space schematic of the inverter (45kW and above)

3.2.3 Inverter Installation

Refer to Fig. 3-5 for the installation procedures:

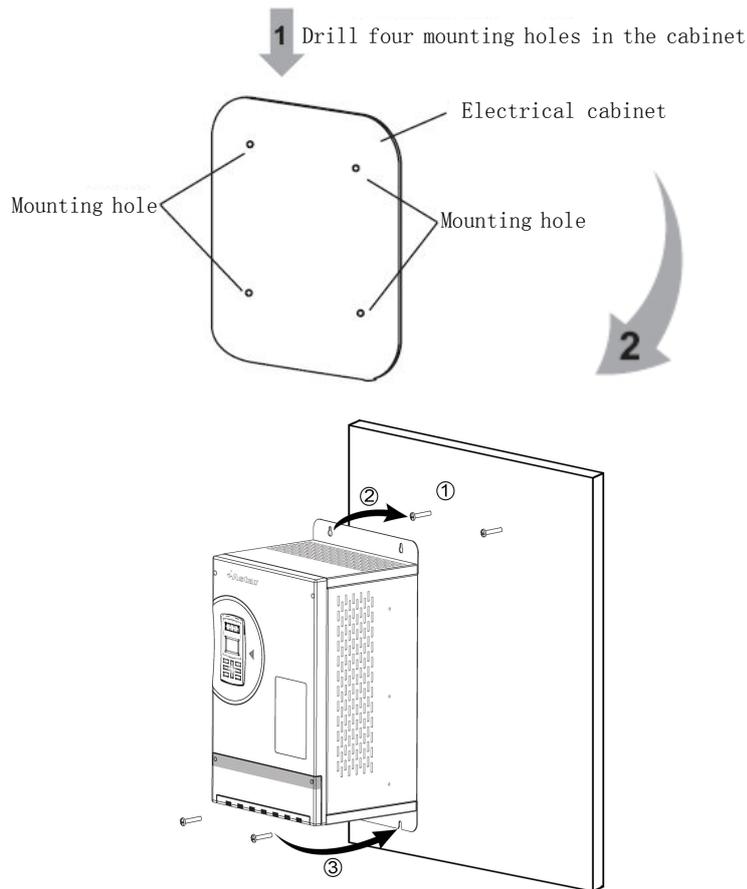


Fig. 3-5 Installation procedures

Important

Fasteners must have anti-vibration parts such as spring washer.
All four mounting screws must be securely tightened.

3.3 Installation and Disassembling of the Operator and Panel

3.3.1 Connect/Disconnect the Operator

3.3.1.1 Disconnect the Operator

① Press latch springs at both sides of operator simultaneously to unhook the operator from the front panel, and then the operator can be removed from inverter.

② A cable at the back of operator connecting to inverter needs to be unplugged.

Note, do not pull directly on the cable, it may damage the connection.

Connect and disconnect operator, see Fig. 3-6



Fig. 3-6 Disconnect operator

3.3.1.2 Connect Operator

Plug the cable into the socket at the back of operator first, then slide one side of latch into the groove of front panel, press operator against the panel until a “Click” sound heard. Both latches are locked properly.

3.3.2 Open/Close Wiring Cap

3.3.2.1 Open Wiring Cap

① Loose two screws on wiring cap;

② Open wiring cap downward.

Open wiring cap, see Fig. 3-7.

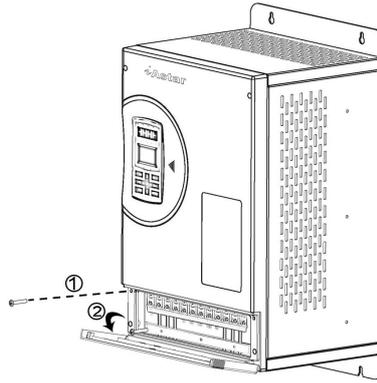


Fig. 3-7 Open wiring cap

3.3.2.2 Close Wiring Cap

Operate open wiring cap procedure reversely to close it, tighten two thumb screws.

3.3.3 Install and Disassemble Front Panel

Front panel needs to be dismounted when controlling loop is wired. For the convenience to wire the main loop the front panel may also be removed.

3.3.3.1 Disassemble Front Panel

Procedures of disassembling front panel:

- ① Remove operator. Refer to chapter 3.3.1 Connect/Disconnect the operator;
- ② Open wiring cap. Refer to chapter 3.3.2 Open/Close wiring cap;
- ③ Loose two screws at top of the front panel and two screws inside wiring cap

and then the front panel can be removed.

The Operation to remove the front panel, see Fig. 3-8.

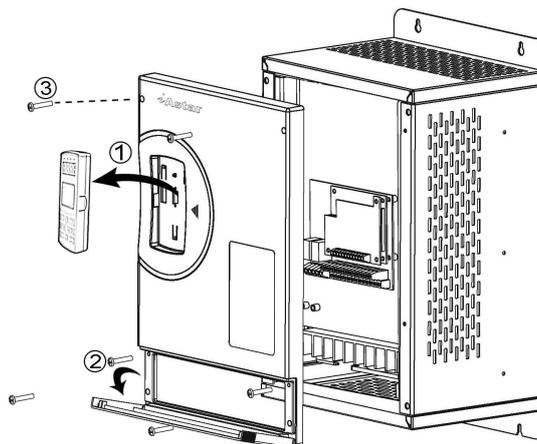


Fig. 3-8 Disassemble front panel

3.3.3.2 Install Front Panel

Install front panel in a reversed order of disassembling the front panel.

Chapter 4 Wiring of the Inverter

This chapter introduces the wire connection in details in inverter and its peripheral equipment, inverter terminal blocks, main circuit looping, controlling circuit looping and PG card.

Danger

- ⊙ **Ensure to have power supply fully disconnected before wiring.**
Or it may cause electric shock.
- ⊙ **Only the certified electrician can handle wiring task.**
Or it may cause electric shock.
- ⊙ **Ensure the protect grounding terminal PE to be grounded reliably.**
Or it may cause electric shock.
- ⊙ **Don't touch terminal block by hand directly, don't connect the output cable to the inverter enclosure.**
Or it may cause electric shock.
- ⊙ **Don't connect power supply to output terminal U, V, W.**
Or it may damage inverter.
- ⊙ **Do not short connect the terminal $\phi 1 / \phi 2$ to ϕ .**
Or it may have a risk of explosion hazard.

Notice

- ⊙ **Ensure the consistency between the voltage of power supply in AC main circuit and rated voltage.**
Or it may cause human injury and fire hazard.
- ⊙ **Connect braking resistor correctly referring to wiring diagram.**
Or it may cause fire hazard.
- ⊙ **Secure fastenedly connect the main circuit to the wiring cables or to the wire crimping terminal.**
Or it may damage inverter.

4.1 Connect Inverter to Peripherals

4.1.1 Connection Diagram between Inverter and Peripherals

Connection diagram between the inverter and its peripheral equipments. See Fig. 4-1.

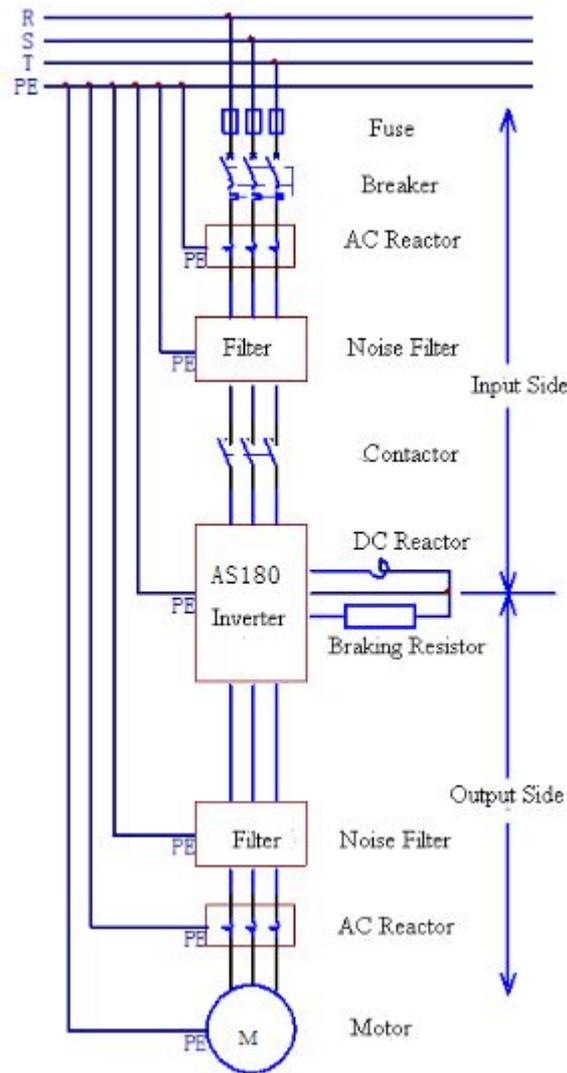


Fig. 4-1 The connection between the inverter and its peripheral equipment

Note: Sample drawing shows 3-phase input power supply.

4.1.2 Connect Inverter to Peripherals

4.1.2.1 Input Power Connection

⚠ Danger Don't operate inverter beyond the rated input voltage range.

Overvoltage may damage inverter permanently.

Table 4-1 The technical requirements for the input power

The connection technical requirements for power input (Main circuit)	
Input Voltage	380~460V AC 3 phase, -15%~+10%
Short Current (IEC60909 Standard)	If incoming cable is properly protected by fuse, the max permissible short current in 1 second is 100kA
Frequency	45~65 Hz
Unbalance	Its maximum is $\pm 3\%$ of rated input line voltage.
Cable Temperature	It's permissible that the inverter works at 90°C for a long-term period.

4.1.2.2 Input Protection

Input protection includes breaker, fuse and emergency stop.

Breaker

Inverter doesn't carry breaker by itself. Therefore breaker must be installed between AC input power supply and the inverter. Ensure the following notice of the breaker:

- Type selection must conform with the applied safety regulation, including (but not limited to) national and local electric regulation.
- During installation and maintenance to the inverter, breaker must ensure to stay at open position and be locked.
- Breaker doesn't allow to control to start or stop the motor. Motor is controlled by operator keypad or I/O terminal command.
- Capacity of selected breaker should be 1.5~2 times of rated inverter current.
- Breaker time response character should correspond with the inverter overheat protection character (over 150% of rated output current for more than 1minute).

Fuse cutout

Terminal user must provide loop protection device, which is consistent with the national and local electric laws and regulations. The table 4-2 introduces recommended fuse cutout types, it provides short protection for inverter incoming cable.

Table 4-2 The recommended fuse cutout types

Inverter Type	Input Current (A)	Main Fuse Cutout IEC269gG(A)	UL Grade T (A)	Type
AS180				
4T02P2	5.3	10	10	CT10
4T03P7	7.5	10	10	CT10
4T05P5	11.5	16	15	CT16
4T07P5	16	20	20	CT20

Inverter Type AS180	Input Current (A)	Main Fuse Cutout IEC269gG(A)	UL Grade T (A)	Type
4T0011	21	35	30	FE35
4T0015	30.5	35	40	FE40
4T18P5	38	45	50	FE45
4T0022	46	50	50	FE50
4T0030	59	71	71	FE71
4T0037	75	80	80	FE80
4T0045	94	100	100	FE100
4T0055	115	160	160	FEE160
4T0075	154	200	200	FEE200
4T0090	183	400	400	FWH-400A
4T0110	216	400	400	FWH-400A
4T0132	261	400	400	FWH-400A
4T0160	306	600	600	FWH-700A
4T0185	367	800	800	FWH-800A
4T0200	402	800	800	FWH-800A
4T0220	427	800	800	FWH-800A
4T0250	481	800	800	FWH-800A
4T0280	533	800	800	FWH-1000A
4T0315	614	800	800	FWH-1000A
4T0355	664	1000	1000	FWH-1200A
4T0400	755	1000	1000	FWH-1200A

Emergency stop

General design and installation must include emergency stop device and other necessary safety equipment. To control motor by operator keypad operation, or I/O commend can't guarantee:

- Emergency motor stop;
- Separate inverter from hazardous voltage.

4.1.2.3 Input Power Cable/Connection

Input cable can be any one of followings:

- 4 core cable (3 phase and ground protection) without shield;
- 4 core insulated cable installed in conduit.

In any circumstances, the size of the conducting wire must smaller than the defined maximum limit value. When motor cable is too long or motor cable cross-section is too large, inverter should be derated and use cable based on the standard of cable cross-section (see Table 4-3). The larger the cross-section of the cable is, the bigger the capacity to the ground is, the lager the leak current to the ground is. When choose cable

with larger cross-section, output current should be reduced. One level added of the cross-section of cable, 5% of the current reduced. Table 4-3 lists types of copper cables under different load currents. Recommended types are only suitable when the situation meets the top part of the table. Aluminum cable is not recommended.

Table 4-3 Relevant standards of IEC and NEC requirements for input power cables

IEC	NEC
Based on: EN 60204-1 and IEC 60364-5-2/2001 standard; PVC Insulation; Ambient temperature at 30 °C; Surface temperature at 70 °C; Copper net shielded symmetrical cable; No more than 9 cables laid side by side in a same cable tray compartment.	Based on: For copper cable , see NEC Table 310-16; Cable insulation at 90 °C; Ambient temperature at 40 °C; No more than 3 current-carrying cables in the same trunking, the cable trench, or the buried cables. Copper net shielded copper core cable

Max Carry Current (A)	Copper cable (mm ²)	Max Carry Current (A)	Copper cable (mm ²)
3.5	1	128	50
6.2	1.5	160	70
9	1.5	195	95
13	1.5	210	95
19	2.5	240	120
27	4	302	185
34	6	352	240
41	10	390	95×2P
48	10	426	95×2P
65	16	480	150×2P
80	25	520	150×2P
96	35	650	95×4P

To ensure human safety, correct operation and to reduce electromagnetic radiation, inverter and motor must be grounded at their installed place.

- The diameter of conductor must meet the requirements of the safety laws and regulations.
- The shielding layer of power cable must be connected to PE terminal of inverter to meet the safety guideline.

- Only when the specifications of the power cable shielding layer meet safety requirements can the shielding layer of power cable be used as ground connection.
- Don't connect terminal blocks in series when multi inverters installed.

4.1.2.4 Output Power Cable/Connection

Table 4-4 Output power (Motor connection technical specification)

Technical specification for output power (motor)	
Output Voltage	0 ~input voltage, symmetric 3-phase
Current	see Chapter 2, "2.2 Technical Indexes and Specifications of the Inverter"
Switch frequency	Allow to set: 1.1~8kHz
Rated cable temperature	Allow long term working at 90 °C
Length of motor cable vs. switch frequency	See Chapter 4, "4.4.5 Relationship between Length of Wire and Carrier Frequency"

Grounding and wiring

Motor cable shielding: Motor cable requires to be shielded by wire conduit, armored cable or shielded cable. Armored cable or shielded cable: high frequency low impedance shielded cable should be adopted, such as braided copper wire mesh, aluminium wire mesh or wire mesh.

Wire conduit

- Each end point of wire conduit must install a grounded bridging.
- Wire conduit needs to be fixed on housing.
- Laying an individual conduit for motor cable only. (separate input power cable and control cable)
- One separated conduit for each inverter

Armored cable

- Each end point of wire conduit must install a grounded bridging;
- To use cable having 6 wires (3 power lines, 3 grounding lines). Type MC continuous corrugated Aluminum armored cable with symmetric grounding lines;
- Metal-clay motor cable can share one cable tray with input power cable. But it can't share with control cable.

Shielded cable

Recommend to use symmetric PE conductor cable certified by CE or C-Tick.

Grounding

Recommended cross-sectional area of grounded wire is in Table 4-13 of Chapter 4.3.4.1.

4.1.2.5 AC Reactor at the Input Side

In order to prevent the large current from flowing into the input power loop and damage the rectifying elements when the peak pulse is input from the grid, AC reactor will be connected at the input side, which also is able to improve power factor of the input side and reduce the higher harmonic current. To effectively protect the inverter, it is recommended to add AC input reactor for 380V inverter 110kW and above (including 110kW).

Selection of AC reactor at the input side refers to Table 4-5.

Table 4-5 The recommended types of input AC resistor

Inverter Type AS180	Power (kW)	Recommended Type	Current (A)	Inductance (mH)	Voltage Drop
4T02P2	2.2	ACR-0007-2M00-0.4SC	7	2.000	2%
4T03P7	3.7	ACR-0010-1M40-0.4SC	10	1.400	2%
4T05P5	5.5	ACR-0015-0M94-0.4SC	15	0.940	2%
4T07P5	7.5	ACR-0020-0M70-0.4SC	20	0.700	2%
4T0011	11	ACR-0030-0M47-0.4SC	30	0.470	2%
4T0015	15	ACR-0040-0M36-0.4SC	40	0.360	2%
4T18P5	18.5	ACR-0050-0M28-0.4SC	50	0.280	2%
4T0022	22	ACR-0060-0M24-0.4SC	60	0.240	2%
4T0030	30	ACR-0080-0M18-0.4SC	80	0.180	2%
4T0037	37	ACR-0090-0M16-0.4SC	90	0.156	2%
4T0045	45	ACR-0120-0M12-0.4SA	120	0.117	2%
4T0055	55	ACR-0150-094U-0.4SA	150	0.094	2%
4T0075	75	ACR-0200-070U-0.4SA	200	0.070	2%
4T0090	90	ACR-0250-056U-0.4SA	250	0.056	2%
4T0110	110	ACR-0250-056U-0.4SA	250	0.056	2%
4T0132	132	ACR-0290-048U-0.4SA	290	0.048	2%
4T0160	160	ACR-0330-042U-0.4SA	330	0.042	2%
4T0185	185	ACR-0390-036U-0.4SA	390	0.036	2%
4T0200	200	ACR-0490-028U-0.4SA	490	0.028	2%
4T0220	220	ACR-0490-028U-0.4SA	490	0.028	2%
4T0250	250	ACR-0600-024U-0.4SA	600	0.024	2%
4T0280	280	ACR-0600-024U-0.4SA	600	0.024	2%

Inverter Type AS180	Power (kW)	Recommended Type	Current (A)	Inductance (mH)	Voltage Drop
4T0315	315	ACR-0660-022U-0.4SA	660	0.022	2%
4T0355	355	ACR-0800-17U5-0.4SA	800	0.0175	2%
4T0400	400	ACR-0800-17U5-0.4SA	800	0.0175	2%

4.1.2.6 Interference Filter at the Input Side

When the inverter is working, other electronic equipment surrounded may be interfered by the power line. Filter is adopted to reduce the interference to the surrounding equipment.

Selection of the filter at the input side of 380V inverter refers to Table 4-6.

Table 4-6 The recommended types of input filter

Inverter Type AS180	Power (kW)	Recommended Type	Current (A)
4T02P2	2.2	RFI4C10	10
4T03P7	3.7	RFI4C10	10
4T05P5	5.5	RFI4C20	20
4T07P5	7.5	RFI4C20	20
4T0011	11	RFI4C36	36
4T0015	15	RFI4C36	36
4T18P5	18.5	RFI4C50	50
4T0022	22	RFI4C50	50
4T0030	30	RFI4C65	65
4T0037	37	RFI4C80	80
4T0045	45	RFI4C100	100
4T0055	55	RFI4C150	150
4T0075	75	RFI4C150	150
4T0090	90	RFI4C200	200
4T0110	110	RFI4C250	250
4T0132	132	RFI4C250	250
4T0160	160	RFI4C300	300
4T0185	185	RFI4C400	300
4T0200	200	RFI4C400	400
4T0220	220	RFI4C600	600
4T0250	250	RFI4C600	600
4T0280	280	RFI4C600	600

Inverter Type AS180	Power (kW)	Recommended Type	Current (A)
4T0315	315	RFI4C900	900
4T0355	355	RFI4C900	900
4T0400	400	RFI4C900	900

Sample diagram for the correct setting of noise filter at power supply side, see Fig. 4-2.

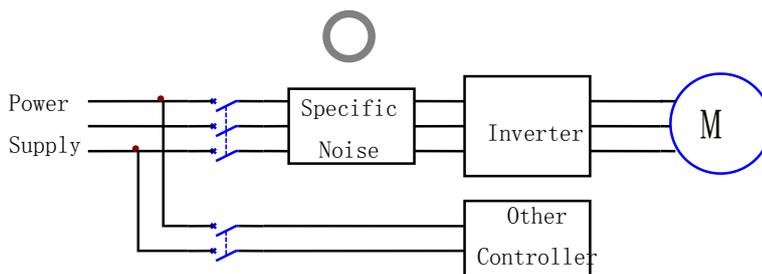


Fig. 4-2 Correct noise filter installation at power supply side

Sample diagram for the incorrect setting of noise filter at power supply side, see Fig. 4-3 and Fig. 4-4.

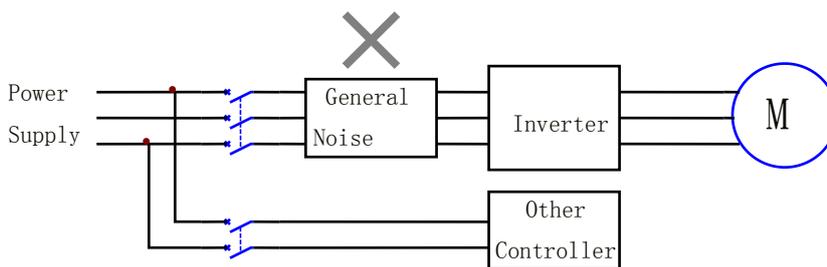


Fig. 4-3 Incorrect noise filter installation at power supply side, example 1

In Fig. 4-3, a general noise filter at power supply side may not meet the required expectation and should be avoided.

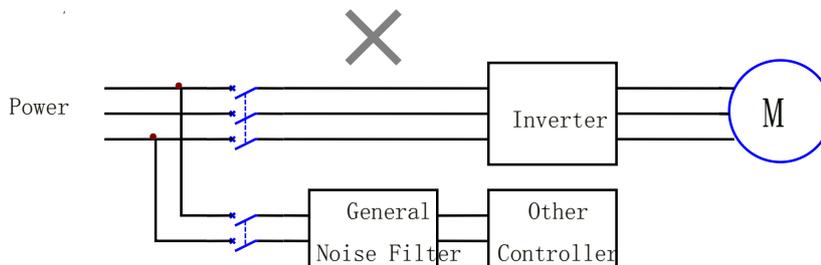


Fig. 4-4 Incorrect noise filter installation at power supply side, example 2

In Fig. 4-4, a general noise filter at receiving side may not meet the required expectation and should be avoided.

Notice: the wire length between filter and inverter should be as short as possible when installing noise filter in the input side.

Filter housing and the installation of the cabinet should be large and reliable connections to reduce reflux of impedance noise current I_g .

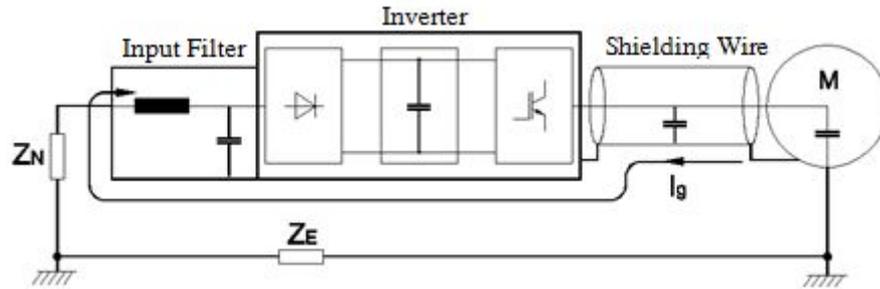


Fig. 4-5 Noise current schematic diagram of noise filter

4.1.2.7 Contactor at the Input/Output Side

In order to protect the power supply and avoid the fault being enlarged, input power of the inverter must be effectively cut off when the system has any fault. Electromagnetic contactor can be mounted at the input side to control power on and off of the main loop, to ensure safety.

Please don't use the contactor to control start and stop of the motor.

4.1.2.8 Interference Filter at the Output Side

Output noise filter may reduce the radio noise caused by the cable between inverter and motor as well as the leakage current of the conductor.

Selection of 380V output filter refers to Table 4-7.

Table 4-7 Recommended selection table of output filter

Inverter Type AS180	Power (kW)	Recommended Type	Current (A)
4T02P2	2.2	RFO4B10	10
4T03P7	3.7	RFO4B10	10
4T05P5	5.5	RFO4B20	20
4T07P5	7.5	RFO4B20	20
4T0011	11	RFO4B36	36
4T0015	15	RFO4B36	36
4T18P5	18.5	RFO4B50	50
4T0022	22	RFO4B50	50
4T0030	30	RFO4B65	65
4T0037	37	RFO4B80	80

Inverter Type AS180	Power (kW)	Recommended Type	Current (A)
4T0045	45	RFO4B100	100
4T0055	55	RFO4B150	150
4T0075	75	RFO4B150	150
4T0090	90	RFO4B200	200
4T0110	110	RFO4B250	250
4T0132	132	RFO4B250	300
4T0160	160	RFO4B300	300
4T0185	185	RFO4B400	400
4T0200	200	RFO4B400	400
4T0220	220	RFO4B600	600
4T0250	250	RFO4B600	600
4T0280	280	RFO4B600	600
4T0315	315	RFO4B900	900
4T0355	355	RFO4B900	900
4T0400	400	RFO4B900	900

4.1.2.9 AC Reactor at the Output Side

AC reactor at the output side can be chosen to control the radio frequency interference from the inverter.

When the wire between the inverter and the motor is too long (>100m) or there are several motors are running, because leakage current produced by the long cable-ground stray capacitance effect is too large, the inverter is easily subject to overcurrent protection, at the same time, output reactor compensation must be increased to avoid motor insulation damage.

Selection of AC reactor refers to Table 4-8.

Table 4-8 Recommended selection table of AC Reactor at the output side

Inverter Type AS180	Power (kW)	Recommended Type	Current (A)	Inductance (mH)	Voltage Droop
4T02P2	2.2	OCR-0007-1M00-0.4SC	7	1.000	1%
4T03P7	3.7	OCR-0010-0M70-0.4SC	10	0.700	1%
4T05P5	5.5	OCR-0015-0M47-0.4SC	15	0.470	1%
4T07P5	7.5	OCR-0020-0M35-0.4SC	20	0.350	1%
4T0011	11	OCR-0030-0M23-0.4SC	30	0.230	1%
4T0015	15	OCR-0040-0M18-0.4SC	40	0.180	1%
4T18P5	18.5	OCR-0050-0M14-0.4SC	50	0.140	1%
4T0022	22	OCR-0060-0M12-0.4SC	60	0.120	1%

Inverter Type AS180	Power (kW)	Recommended Type	Current (A)	Inductance (mH)	Voltage Droop
4T0030	30	OCR-0080-087U-0.4SC	80	0.087	1%
4T0037	37	OCR-0090-078U-0.4SC	90	0.078	1%
4T0045	45	OCR-0120-058U-0.4SA	120	0.058	1%
4T0055	55	OCR-0150-047U-0.4SA	150	0.047	1%
4T0075	75	OCR-0200-035U-0.4SA	200	0.035	1%
4T0090	90	OCR-0250-028U-0.4SA	250	0.028	1%
4T0110	110	OCR-0250-028U-0.4SA	250	0.028	1%
4T0132	132	OCR-0290-024U-0.4SA	290	0.024	1%
4T0160	160	OCR-0330-021U-0.4SA	330	0.021	1%
4T0185	185	OCR-0390-018U-0.4SA	390	0.018	1%
4T0200	200	OCR-0490-014U-0.4SA	490	0.014	1%
4T0220	220	OCR-0490-014U-0.4SA	490	0.014	1%
4T0250	250	OCR-0600-012U-0.4SA	600	0.012	1%
4T0280	280	OCR-0600-012U-0.4SA	600	0.012	1%
4T0315	315	OCR-0660-011U-0.4SA	660	0.011	1%
4T0355	355	OCR-0800-08U7-0.4SA	800	0.0087	1%
4T0400	400	OCR-0800-08U7-0.4SA	800	0.0087	1%

4.1.2.10 DC Reactor

AS180 series inverter $\geq 30\text{kW}$ (400V grade) is provided with built-in DC reactor, which is able to improve the power factor, avoid too large input current of the inverter due to the large capacity transformer connected, leading to damage of the rectifier bridge, as well as avoid the damage caused by harmonic due to voltage leap of the grid or phase control load to the rectifying circuit.

AS180 series inverter below 30kW (400V grade) is provided with externally installed DC reactor. Refer to Table 4-9 for its selection.

Table 4-9 Recommended selection table of DC reactor

Inverter Type AS180	Power (kW)	Recommended Type	Current (A)	Inductance (mH)
4T02P2	2.2	DCR-0010-6M30-0.4DC	10	6.3
4T03P7	3.7	DCR-0010-6M30-0.4DC	10	6.3
4T05P5	5.5	DCR-0015-3M60-0.4DC	15	3.6
4T07P5	7.5	DCR-0020-3M60-0.4DC	20	3.6
4T0011	11	DCR-0030-2M00-0.4DA	30	2

4T0015	15	DCR-0040-2M00-0.4DA	40	2
4T18P5	18.5	DCR-0040-1M30-0.4DA	40	1.3
4T0022	22	DCR-0050-1M08-0.4DA	50	1.08
4T0030	30	DCR-0065-0M80-0.4DA	65	0.8

4.2 Wiring of Inverter Terminals

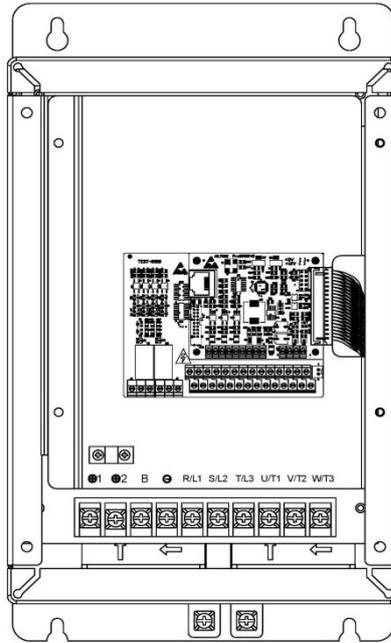


Fig. 4-6 Internal view of the inverter

Note: terminals of the inverter with different power level are the same in terms of position and arrangement except for those power input/output terminals. We take 11kW inverter as an example in the figure.

4.2.1 Wiring Diagram of the Inverter Terminals

Basic wiring diagram of the inverter with no built-in DC reactor and built-in braking unit is shown as Fig.4-7.

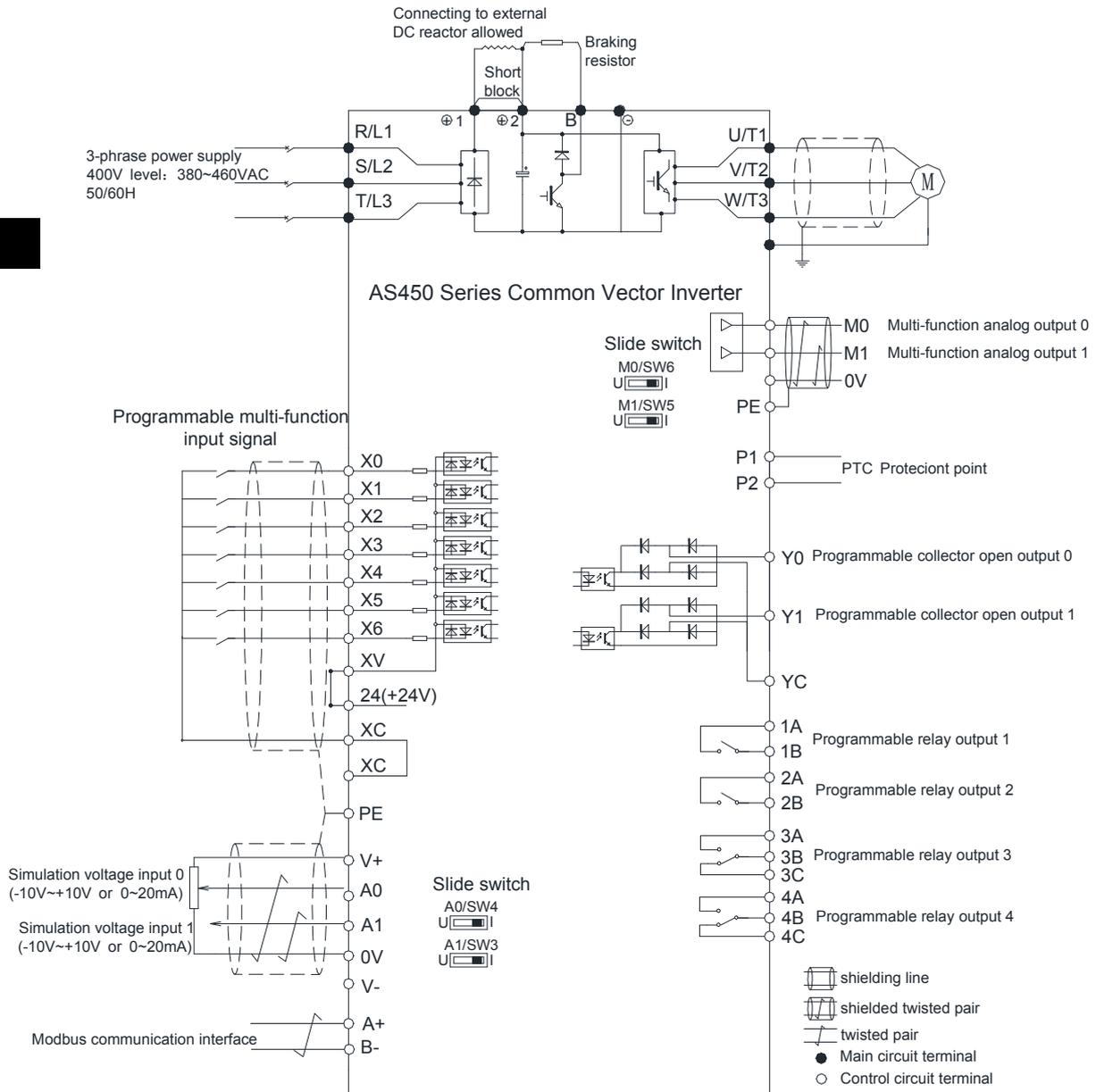


Fig. 4-7 Wiring schematic of high performance vector inverter terminals (30kW and below)

Note: input power in the diagram is given taking 3-phase power input as an example, 3-phase 380-600V power input for 400V grade inverter.

Basic wiring diagram of the inverter with built-in DC reactor and no built-in braking unit is shown as Fig. 4-8.

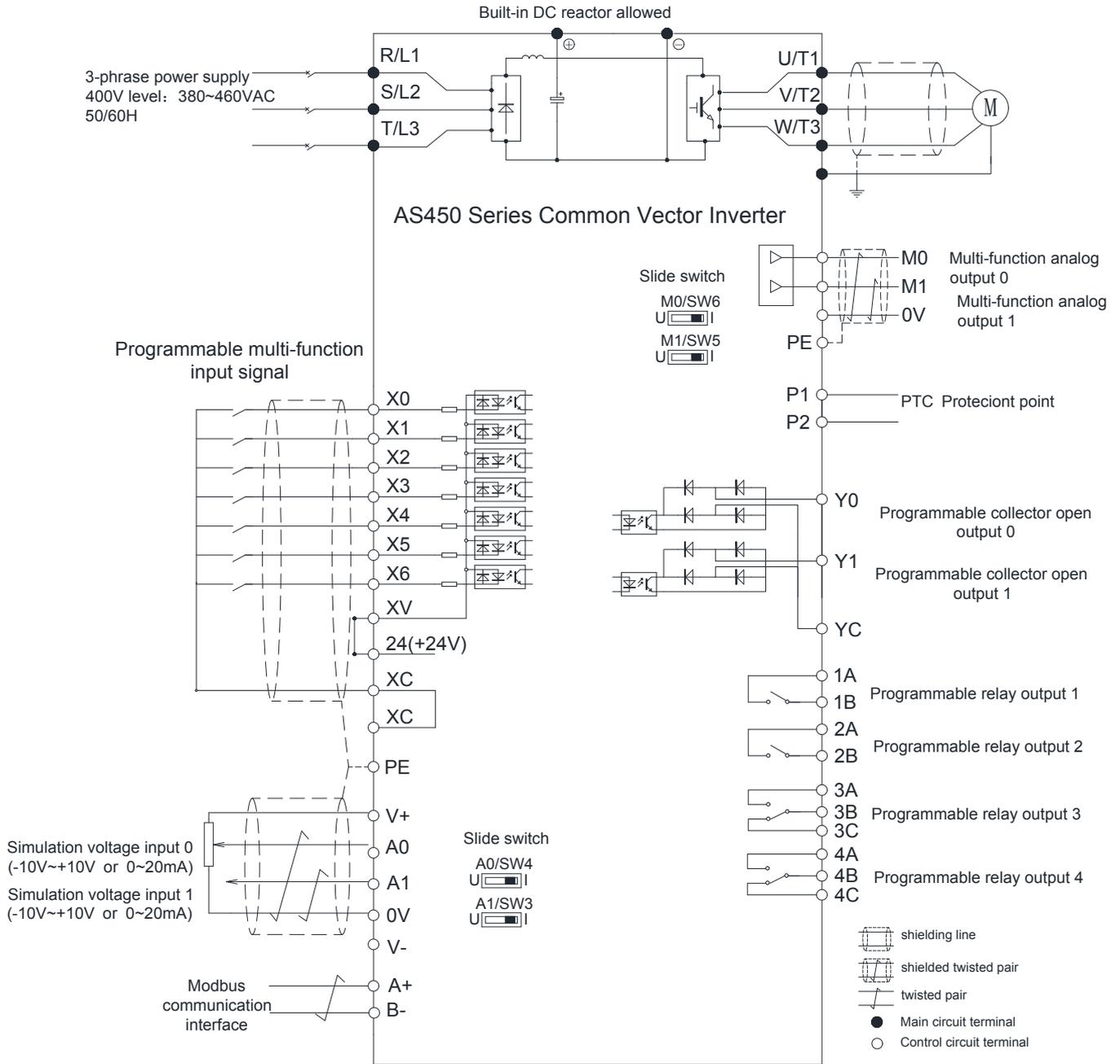


Fig. 4-8 Wiring schematic 2 of inverter terminals (30kW and above)

Notes:

- Optional analog voltage and current signals can be input to A0/A1 simultaneously.

2. This inverter isn't provided with braking unit, but with the terminals for external connection.

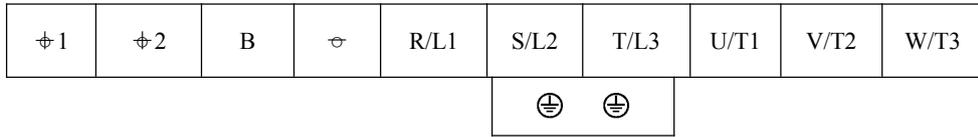
4.2.2 Terminal wiring precaution

Important

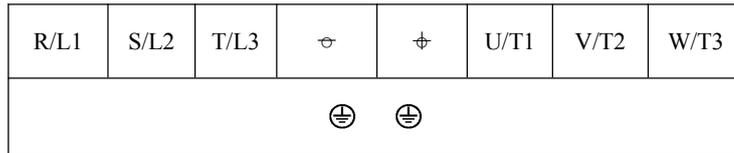
- a) Wiring should meet standard of electrician regulation.
- b) Ensure wiring is correctly and reliably after finish of wire connection. Need to check-up:
 - ◆ Is wiring correct?
 - ◆ Is any loose piece, like wire clipping, screw left in the inverter?
 - ◆ Any loosening screw?
 - ◆ Does the stripped wire of the terminal parts contact to any other terminal?
- c) AS180 series inverter equipments (30kW and below) inside braking component. But it needs to connect external braking resistor. Braking resistor should be installed between terminal B and $\phi 2$. Please don't install them anywhere else, or it may damage braking resistor and inverter. AS180 series inverter equipments (greater than 30kW) outside braking component.
- d) AS180 series inverter equipments (30kW and below) Select DC reactor is installed between terminal $\phi 1$ and $\phi 2$, and short block between those terminals needs to be taken off. AS180 series inverter equipments (greater than 30kW) inside DC reactor.
- e) For AS180 series inverter equipments (30kW and below), if bus low voltage running function is needed, the emergency 220V power supply needs to be connected at terminals R0 and T0 on extended power board. A 48V DC power supply need to be connected between terminal R and S at the same time. No extra connection needs if there is no bus low voltage running function.
- f) Inverter grounding point PE is recommended to ground to specialized grounding spot. The grounding resistance should be below 10 Ω .
- g) Keep the grounding cable as short as possible.
- h) If there is any wire alteration required after power on, disconnect the power supply first. The capacity in main circuit needs a certain time to discharge. To avoid any hazard, charging indicator must be off, and then the DC voltage on charging capacity should be measured by DC voltmeter and is below a safety voltage of 24V before any further work.

4.3 Main Circuit Terminal Wiring

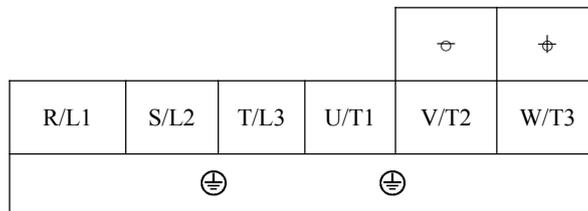
4.3.1 Line-up of Main Circuit Terminals



a) 30kW and below



b) 37kW~75kW



c) 75kW~400kW

Fig. 4-9 The line-up of connection terminals of the main circuit

3.2 Main Circuit Terminal Label and Function Specification

Function specification for main circuit terminals, see Table 4-10.

Table 4-10 Function specification of main circuit terminals

Terminal Label	Function Specification
ϕ1	May connect external DC reactor. Short connected by factory default
ϕ2	
ϕ2	Connect to external braking resistor
B	
ϕ2/ϕ	DC Bus cable positive/negative output terminal. May connect external DC reactor or common DC bus.
⊖	
R/L1	Main circuit input AC power supply, connecting 3 phase input
S/L2	
T/L3	
U/T1	Inverter output, connecting 3 phase async motor
V/T2	

Terminal Label	Function Specification
W/T3	
	Ground terminal, connect the protective ground, when the 400V class ground resistance is not greater than 4Ω

4.3.3 Main Circuit Wire Specification

600V insulated copper conductor power supply cable is used. Specification of wire and tightening torque, see Table 4-11.

Table 4-11 Wire Specification and Tightening Torque

Model-AS180	Connectable wire specification (mm ²)	Recommended wire specification (mm ²)	Tightening Torque (N.m)
4T02P2	1.5~2.5	2.5	2.7
4T03P7	2.5~4	4	2.7
4T05P5	4~8	6	2.7
4T07P5	4~8	6	2.7
4T0011	4~8	6	2.7
4T0015	8~16	16	3
4T18P5	8~16	16	3
4T0022	25~35	25	3
4T0030	35~50	35	6
4T0037	50~70	50	6
4T0045	70~95	70	6
4T0055	95	95	6
4T0075	85~115	95	10
4T0090	85~115	95	10
4T00110	95~135	120	10
4T0132	165~205	185	10
4T0160	205~265	240	10
4T0185	85~115(×2P)	95×2P	10
4T0200	85~115(×2P)	95×2P	10
4T0220	125~175(×2P)	150×2P	10
4T0250	125~175(×2P)	150×2P	10
4T0280	125~175(×2P)	150×2P	17
4T0315	85~115(×4P)	95×4P	17
4T0355	85~115(×4P)	95×4P	17
4T0400	85~115(x4P)	95x4P	17

 **Important**

The wire specifications are determined under the ambient temperature of 50°C, and the wire allowable temperature of 75°C.

Inverter main circuit uses open terminal block. Round crimp terminal should be used for open terminal block. To select round crimp terminal, see Table 4-12.

Table 4-12 Round crimp terminal

Cross Section Area (mm ²)	Terminal Screw	Round crimp terminal
0.5	M3.5	1.25/3.5
	M4	1.25/4
0.75	M3.5	1.25/3.5
	M4	1.25/4
1.25	M3.5	1.25/3.5
	M4	1.25/4
2	M3.5	2/3.5
	M4	2/4
	M5	2/5
	M6	2/6
	M8	2/8
3.5/5.5	M4	5.5/4
	M5	5.5/5
	M6	5.5/6
	M8	5.5/8
8	M5	8/5
	M6	8/6
	M8	8/8
14	M6	14/6
	M8	14/8
22	M6	22/6
	M8	22/8
30/38	M8	38/8
50/60	M8	60/8
	M10	60/10
80	M10	80/10
100	M10	100/10
120	M12	120/12
185	M12	185/12
240	M12	240/12
300	M12	300/12
380	M12	380/12

 **Important**

Voltage drop of wire should be fully considered while selecting the wire cross section.

Typically maintains voltage within 2% of rated voltage, the cross section of wire needs to be increased if voltage drop is too heavy. Formula for calculating of voltage drop is:

$$\text{Line to line voltage drop (V)} = \sqrt{3} * \text{Line resistance } (\Omega) * \text{Current (A)}$$

4.3.4 Detailed Wiring Description for Terminals of the Main Loop

4.3.4.1 Power Supply

The inverter must be connected to the protected ground. Considering the high leakage current (exceeding 3.5mA), protective grounding must be taken for the purpose of observing the related current regulations.

4.3.4.2 Grounding Terminal (PE)

- Grounding terminal is recommended to ground to designated grounding spot, must be grounded reliably. The grounding resistance should be below 10Ω;
- Don't share grounding cable with welding machine, or other power devices;
- Grounding cable should comply with the technical standard for electric equipment, and should be as short as possible. The current leakage will cause instability of voltage potential at grounding terminal if the distance between grounding cable and grounding spot is too far;
- Recommend to use specific green-yellow ground cable; see Table. 4-13.

Table 4-13 The cross section of grounding conductor

Installation: the cross section of conductor S(mm ²)	Minimum cross section of grounding conductor Smin (mm ²)
S≤16	S
16<S≤35	16
35<S	S/2

- When multi-inverter are grounded, try to avoid looping the connection. Methods of multi-inverter grounding connection, see Fig. 4-10.

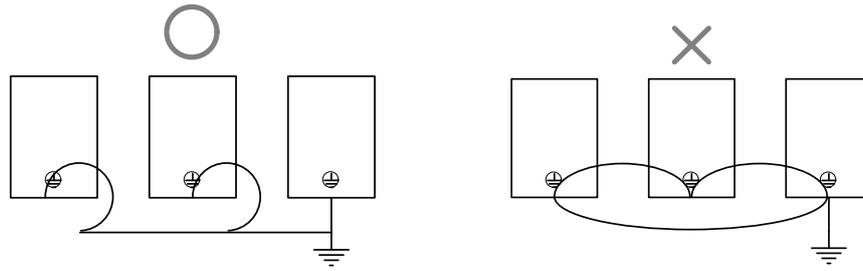


Fig. 4-10 Methods of multi-inverter grounding connection

⚠ Notice

Incorrect wiring:

If voltage of the input line is applied on (U/T1, V/T2, W/T3), the inverter will be damaged.

Examine power connection before the inverter is powered on.

If it needs to replace another inverter, please confirm that all wiring to the inverter conforms to the wiring instruction in this manual.

Nonobservance of the instruction manual will lead to death or serious injury.

4.3.4.3 DC +48V Power Supply Terminal (⊕2, ⊖)

- In case of power failure, storage battery may input +48V DC power supply to inverter via terminal (⊕2 ⊖). It can operate the motor at a low speed and protect the machine from shock.

4.3.4.4 Power Supply Input terminals for Main Circuit (R/L1, S/L2, T/L3)

- Three phase AC power supply cable connects the main circuit terminals R/L1, S/L2, T/L3 via the breaker. The phase sequence of input power doesn't relate to the order of terminals R/L1, S/L2, T/L3. Any terminal can be connected.
- A noise filter can be installed at the power supply side in order to reduce transmission and radiation interference created by inverter. The noise filter can reduce the electromagnetic noise intruded from the power wire. It can also reduce the electromagnetic noise sent from inverter to power cable.

⚠ Notice

Please use the specialized noise filter for inverter only.

4.3.4.5 External DC Reactor Terminals (⊕1, ⊕2)

- External DC reactor can be added to improve the power factor of inverter. Terminal ⊕1, ⊕2 is short connected by short block by the factory pre-setting.

To connect DC reactor, short block needs to be removed first, then proceeds the connection.

- Do not take off the short block if no DC reactor is used, or inverter may work abnormally.

Connecting short block, see Fig. 4-11.

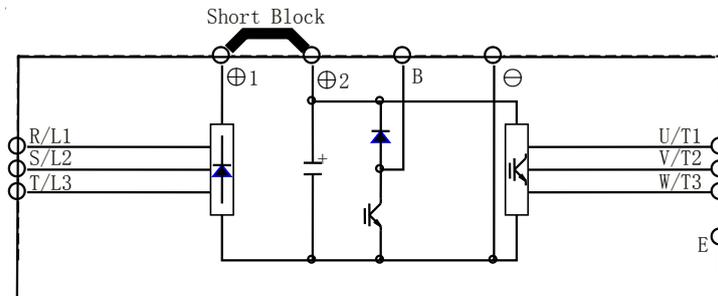


Fig. 4-11 Connection diagram for short block

Connecting external DC reactor, see Fig. 4-12.

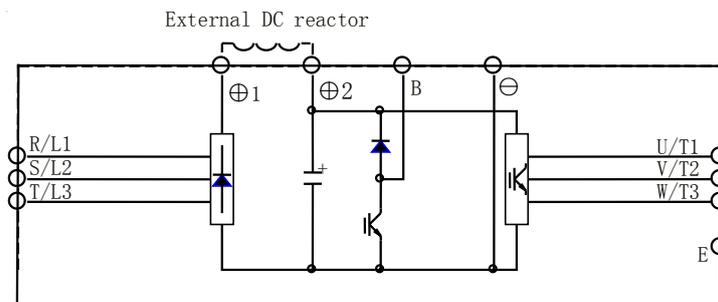


Fig. 4-12 Connection diagram for external DC reactor

4.3.4.6 External Braking Resistor Terminal (⊕2, B)

- AS180 inverter ($\leq 30\text{kW}$) is installed a built-in braking unit. External braking resistor is necessary to absorb released energy by motor braking. Table 2-2 400V Inverter Braking Resistor lists the specification of braking resistor.
- Braking resistor is installed between terminal $\oplus 2$ and B.
- In order to maintain the braking resistor working, the heat dissipation characteristic of braking resistor should be fully considered, and it should be well ventilated.
- The cable length of braking resistor connection can't be longer than 5m.

External braking resistor connection, see Fig. 4-13.

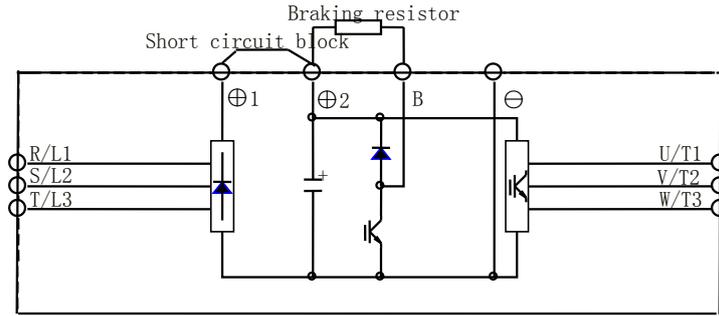


Fig. 4-13 Connection diagram for external braking resistor

4.3.4.7 Terminals of the External Braking Unit(⊕, ⊖)

- When an outer braking unit is required, its ⊕ and ⊖ will be corresponding to (⊕, ⊖) of the inverter one to one, with braking resistor being connected at its terminals BR1 and BR2.
- Length of the wire between (⊕, ⊖) of the inverter and (⊕, ⊖) of the braking unit shall be less than 5m, while that of the wiring for BR1 & BR2 of the braking unit and the braking resistor shall be less than 10m.

Notice

Polarity of ⊕ and ⊖ won't be reversed, without braking resistor directly connected, otherwise it may cause inverter damage or fire.

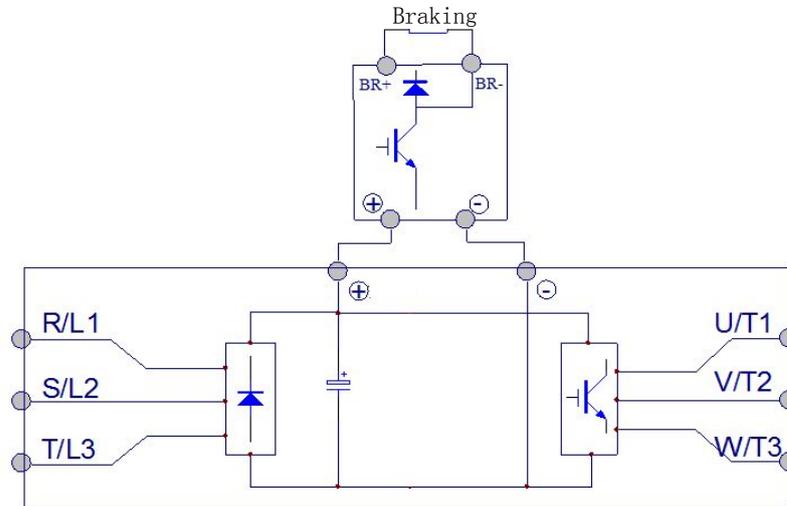


Fig. 4-14 Diagram of outer braking unit

4.3.4.8 Connection of Energy Feedback Unit

Our RG series energy feedback unit is able to feedback the electric power generated by the generator under regenerative braking to the grid. RG series energy feedback adopts IGBT as rectified feedback, comparing to the traditional 3-phase antiparallel bridge rectifier unit, its harmonic distortional component is less than 5% fundamental wave, with small pollution to the grid.

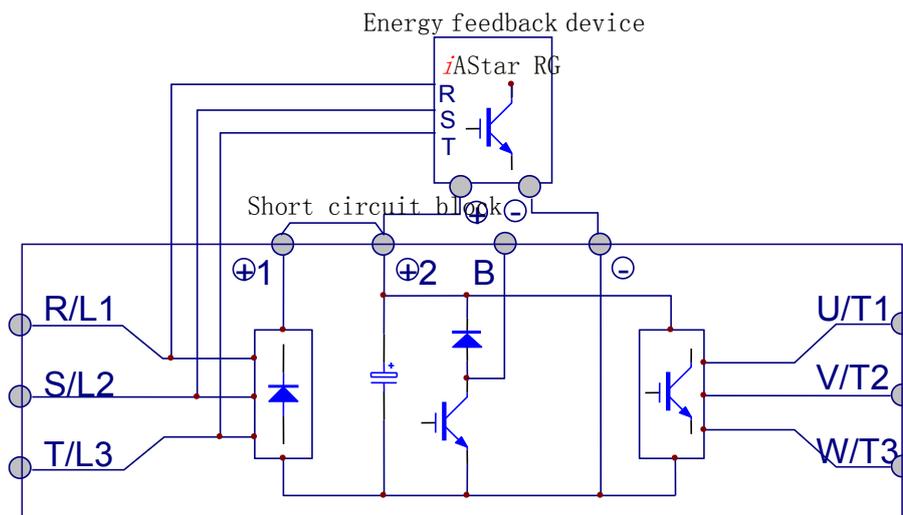


Fig. 4-15 Diagram of outer energy feedback device

4.3.4.9 Inverter Output Terminal (U/T1, V/T2, W/T3)

- Inverter output terminal U/T1, V/T2, W/T3 connects motor terminal U, V, W. If motor runs in wrong direction, please switch any two wires at inverter output or motor terminals.
- Never connect power supply input to inverter output U/T1, V/T2, W/T3 directly.
- Never ground, short the output terminals;
- Never install capacitors/surge filter at inverter output side, or it may cause the inverter overheat, or damage due to the output of higher harmonics.
- Never connect capacitor at inverter output side, see Fig. 4-16.

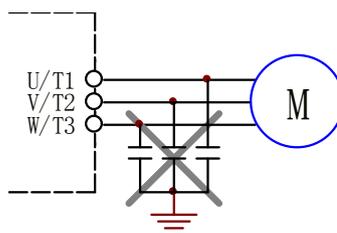


Fig. 4-16 Never connect capacitor at inverter output side

4.4 Anti-interference Measures

4.4.1 Connect Specific Noise Filter at Output

In order to restrain noise at inverter output side, a specific noise filter can be installed. To install a filter at output side, see Fig. 4.17.

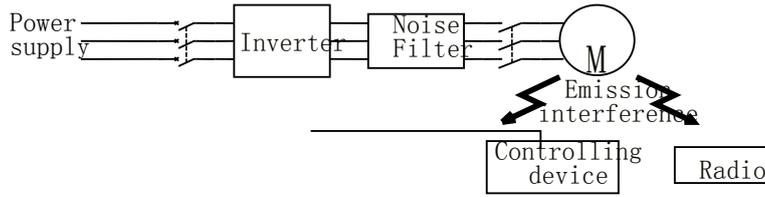


Fig. 4-17 Connection diagram for noise filter at output side

4.4.2 Surge Suppressor at Output Side

When the inverter connects to an inductive load equipment (electromagnetic contactor, relay and solenoid valve etc), please be sure to apply a surge suppressor on its coil, shown as Fig. 4-18.

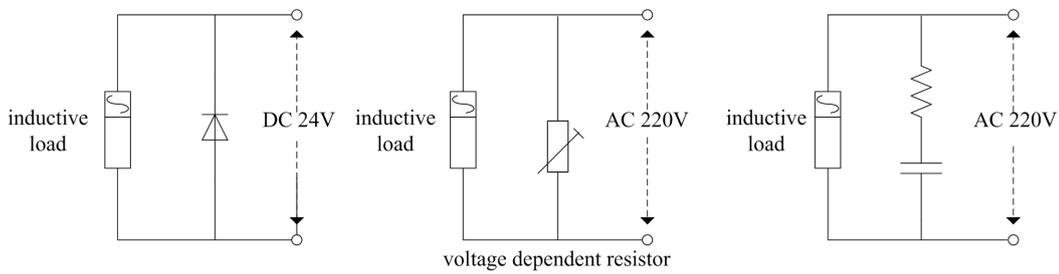


Fig. 4-18 Application of surge suppressor in the inductive load

4.4.3 Wiring Arrangement of the Main Loop

In order to control the radiated interference from output side of the inverter and enhance the anti-interference performance, enough distance shall be guaranteed between them and as far as possible, especially when the cable is laid in parallel or extended for a long distance. When the signal cable must pass through the power cable, then it will vertically pass through it. Wiring arrangement schematic of the main loop is shown as Fig. 4-19 and Fig. 4-20.

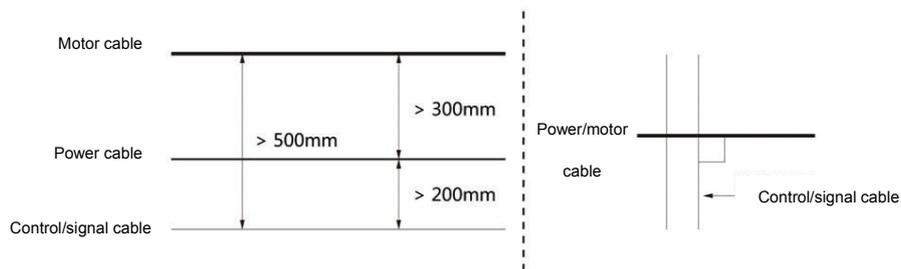


Fig. 4-19 Wiring arrangement 1 of the main loop

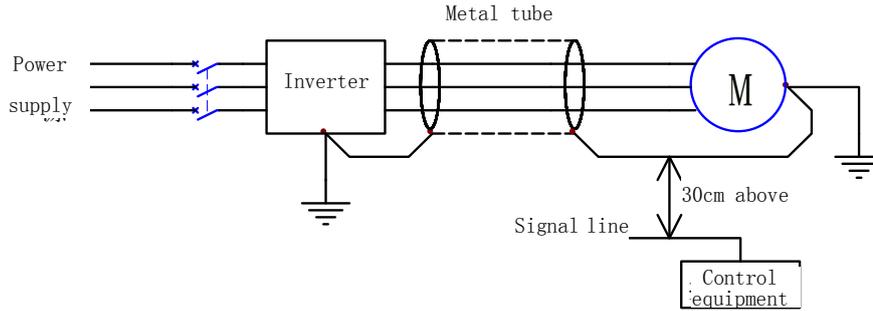


Fig. 4-20 Wiring arrangement 2 of the main loop

Generally, control cable must be shielded cable, and shielding wire mesh must be connected to the metal case of inverter through the cable clamps on both sides, shown as Fig. 4-21.

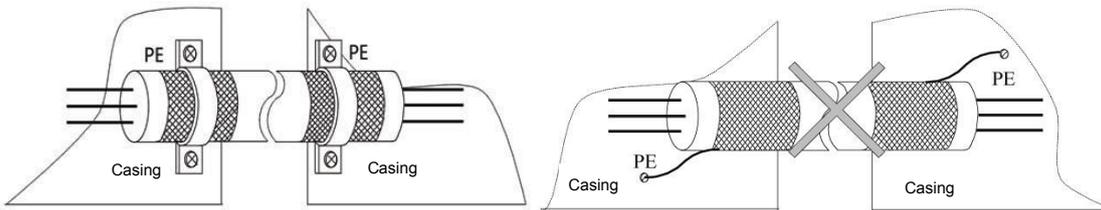


Fig. 4-21 Contrast of grounding mode

4.4.4 Proper Method against Interference

To have better anti-interference method, both inverter input and output sides are installed noise filter, and inverter is shielded in enclosed steel cabinet. See Fig. 4-22.

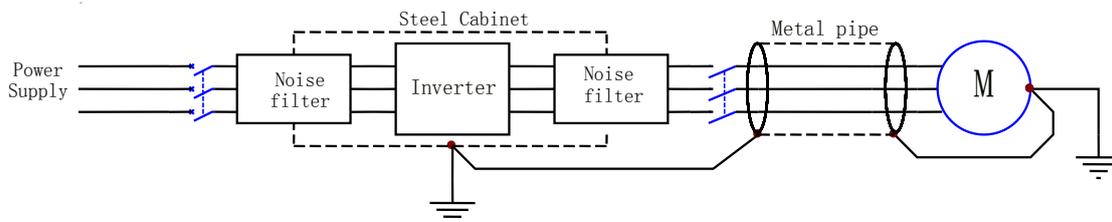


Fig. 4-22 Better anti-interference method

4.4.5 Relationship between Length of Wire and Carrier Frequency

The distributed capacitance on long cable between inverter and motor will increase higher harmonic current leakage. It may trigger output over-current protection, and causes negative impact on peripheral equipment and motor. The length of cable between inverter and motor shall not be longer than 100m. Otherwise output side filter and reactor is needed, and carrier frequency needs to be tuned to P02.14 by referring to following table.

Table 4.14 The cable length between inverter and motor

Wire Distance between inverter and motor	Less than 100m	Over 100m
Carrier frequency	Below 8kHz	Below 5kHz

4.5 Control Circuit Terminal Wiring

4.5.1 Line-up of Control Circuit Terminals

Layout of control circuit terminals, see Fig. 4-23.

Chapter 4 Wiring of the Inverter

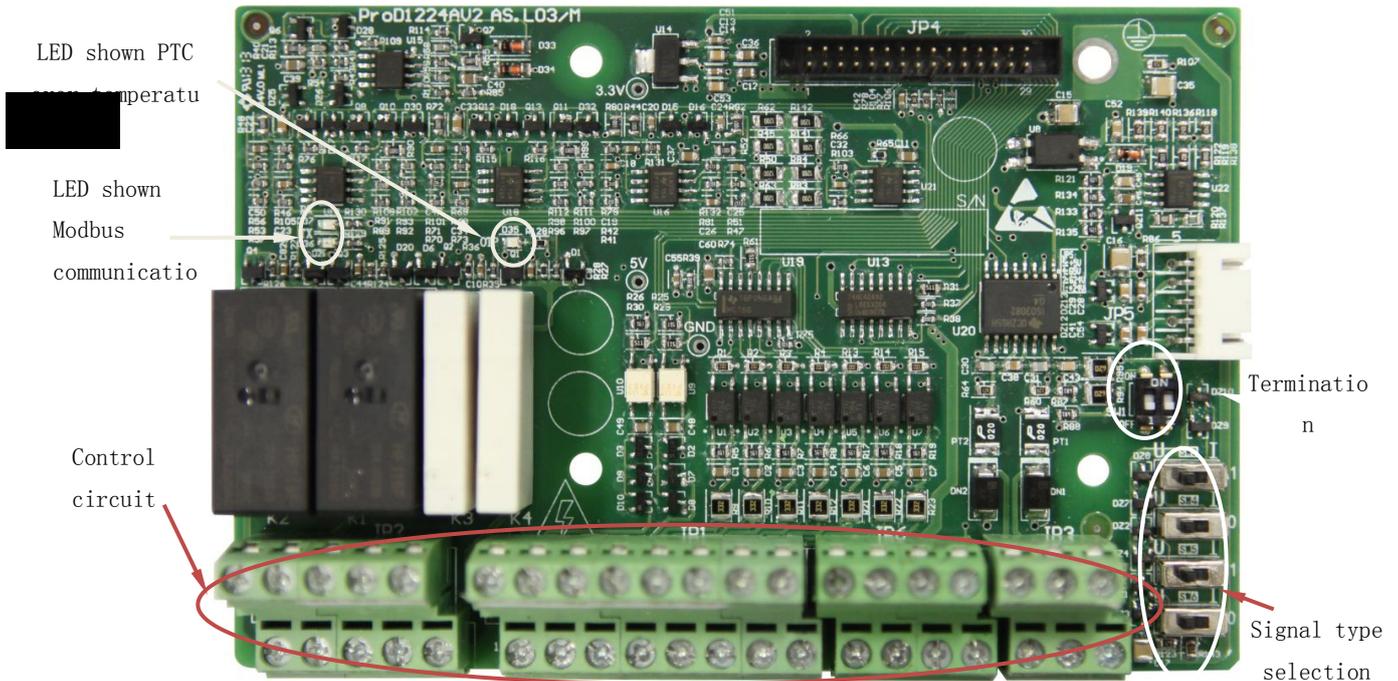


Fig. 4-23 Picture of control circuit terminals

A0/A1 is able to input analog voltage signal (-10V~+10V) or analog current signal (0~20mA), with its input mode to be determined by the toggle switch of each port.

M0/M1 is able to output analog voltage signal (-10V~+10V) or analog current signal (0~20mA), with its output mode to be determined by the toggle switch of each port.

When the switch is toggled to U, its corresponding port will be at voltage working mode; while it is toggled to I, its corresponding port will be at current working mode. Toggle switch of I/O voltage/ current is arranged as Fig. 4-24:



Fig. 4-24 Selection detail of signal type

4.5.2 Control Circuit Terminal Label

Labels of control circuit terminal, see Fig. 4-25.

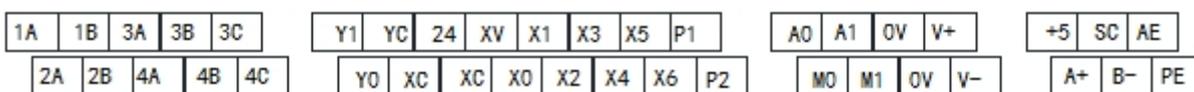


Fig. 4-25 Control circuit terminal label

4.5.3 Functional Description for Terminals of the Control Circuit

Functional description for terminals of the control loop refers to Table 4-15.

Table 4-15 Functional description for terminals of the control circuit

Name	Terminal	Signal	Remarks				
Digital input terminal	X0	Multi-function input 0(Function code: P30.00)	Input signal valid when connect closed. Function is select by function code P30 group. Specification for digital input circuit: <table border="1" style="margin: 10px auto;"> <tr> <td>Internal power</td> <td>+24VDC</td> </tr> <tr> <td>Max. load current</td> <td>100mA</td> </tr> </table>	Internal power	+24VDC	Max. load current	100mA
	Internal power	+24VDC					
	Max. load current	100mA					
	X1	Multi-function input 1(Function code: P30.01)					
	X2	Multi-function input 2(Function code: P30.02)					
	X3	Multi-function input 3(Function code: P30.03)					
	X4	Multi-function input 4(Function code: P30.04)					
	X5	Multi-function input 5(Function code: P30.05)					
	X6	Multi-function input 6(Function code: P30.06)					
	24	Internal +24VDC power output					
XV	Input common terminal 24V						
XC	Input common terminal 0V						

Analog input terminal	A0	Multi-function analog input 0 (Function code: P32.01)	External analog voltage/current input, Analog voltage level range: -10+10V or 0~10V, Rin=34Ω, Analog current level range: 0~20mA or 4~20mA, Rin=120Ω can be used as input signal for given analog speed							
	A1	Multi-function analog input 1 (Function code: P32.07)								
	V+	+10V Power output	Analog input +10VDC at power output side, max allowed current: 20mA							
	V-	-10V Power input	Analog input -10VDC at power output side, max allowed current: 20mA							
	0V	Reference ground for analog input	Reference ground for analog input							
Relay output terminal	1A 1B	Programmable relay output (Function code: P31.00) NO (Normally Open contact)	<p>Programmable relay output function can be selected from function code P31 group..</p> <p>The contact specification for a pair of switching contacts is as follows:</p> <table border="1"> <thead> <tr> <th>Item</th> <th>Specification</th> </tr> </thead> <tbody> <tr> <td>Rate capacity</td> <td>Inductance:1.5A/250V AC</td> </tr> <tr> <td>Switch frequency 120/min</td> <td>Failure rate "P" 10mA/5V</td> </tr> </tbody> </table>	Item	Specification	Rate capacity	Inductance:1.5A/250V AC	Switch frequency 120/min	Failure rate "P" 10mA/5V	
	Item	Specification								
	Rate capacity	Inductance:1.5A/250V AC								
Switch frequency 120/min	Failure rate "P" 10mA/5V									
2A 2B	Programmable relay output (Function code: P31.01) NO (Normally Open contact)	<p>Programmable relay output function can be selected from function code P31 group..</p> <p>The contact specification for a pair of switching contacts is as follows:</p> <table border="1"> <thead> <tr> <th>Item</th> <th>Specification</th> </tr> </thead> <tbody> <tr> <td>Rate capacity</td> <td>Resistive: 4.5A 250VAC/30VAC Inductance: 0.4A 250VAC/30VDC</td> </tr> <tr> <td>Switch frequency 120/min</td> <td>Failure rate "P" 10mA/5V</td> </tr> <tr> <td>Response time</td> <td>Less than 10ms</td> </tr> </tbody> </table>	Item	Specification	Rate capacity	Resistive: 4.5A 250VAC/30VAC Inductance: 0.4A 250VAC/30VDC	Switch frequency 120/min	Failure rate "P" 10mA/5V	Response time	Less than 10ms
Item	Specification									
Rate capacity	Resistive: 4.5A 250VAC/30VAC Inductance: 0.4A 250VAC/30VDC									
Switch frequency 120/min	Failure rate "P" 10mA/5V									
Response time	Less than 10ms									
3A 3B 3C	Programmable relay output (Function code: P31.02) 3A-3B: NO (Normally Open contact) 3B-3C: NC (Normally Closed contact)	<p>Programmable relay output function can be selected from function code P31 group..</p> <p>The contact specification for a pair of switching contacts is as follows:</p> <table border="1"> <thead> <tr> <th>Item</th> <th>Specification</th> </tr> </thead> <tbody> <tr> <td>Rate capacity</td> <td>Resistive: 4.5A 250VAC/30VAC Inductance: 0.4A 250VAC/30VDC</td> </tr> <tr> <td>Switch frequency 120/min</td> <td>Failure rate "P" 10mA/5V</td> </tr> <tr> <td>Response time</td> <td>Less than 10ms</td> </tr> </tbody> </table>	Item	Specification	Rate capacity	Resistive: 4.5A 250VAC/30VAC Inductance: 0.4A 250VAC/30VDC	Switch frequency 120/min	Failure rate "P" 10mA/5V	Response time	Less than 10ms
Item	Specification									
Rate capacity	Resistive: 4.5A 250VAC/30VAC Inductance: 0.4A 250VAC/30VDC									
Switch frequency 120/min	Failure rate "P" 10mA/5V									
Response time	Less than 10ms									

	4A 4B 4C	Programmable relay output (Function code: P31.03) 4A-4B: NO (Normally Open contact) 4B-4C: NC (Normally Closed contact)					
Transistor open collector terminals	Y0	Programmable open collector output 1 (Function Code: P31.04)	Programmable open collector output function can be select by function code P31。 Capable drive: less than DC30V, 50mA				
	Y1	Programmable open collector output 2 (Function Code: P31.05)					
	YC	Programmable open collector output common terminal					
Analog output terminal	M0	Programmable analog output 1 (Function code: P33.00)	Analog voltage/current output: Analog voltage output: -10+10V or 0~10V, $R_L \geq 1k\Omega$, Analog current output: 0~20mA or 4~20mA, $R_L \leq 500\Omega$ It can output to monitor or other device input.				
	M1	Programmable analog output 2 (Function code: P33.03)					
	0V	Reference ground of analog output signal		Analog output signal reference ground			
High temperature protection terminal	P1, P2	PTC functional connection port (Function code P30.07)	Model of the matched temperature sensor: PT1000 High temperature protection point: 120°C <table border="1" style="margin-left: 20px;"> <tr> <td rowspan="2">Status indicator (green) D35</td> <td>ON: normal temperature</td> </tr> <tr> <td>OFF: high temperature protection</td> </tr> </table>	Status indicator (green) D35	ON: normal temperature	OFF: high temperature protection	
Status indicator (green) D35	ON: normal temperature						
	OFF: high temperature protection						
Modbus communication terminal	A+	Modbus communication signal +	Signal terminal of Modbus communication				
			<table border="1" style="margin-left: 20px;"> <tr> <td rowspan="4">Communication status indicator</td> <td rowspan="2">Yellow (TX) D36</td> <td>ON: IO board is sending data to the bus</td> </tr> <tr> <td>OFF: IO board isn't in sending status</td> </tr> <tr> <td rowspan="2">Green (TX) D37</td> <td>ON: IO board is receiving data from the bus</td> </tr> <tr> <td>OFF: IO board isn't in receiving status</td> </tr> </table>	Communication status indicator	Yellow (TX) D36	ON: IO board is sending data to the bus	OFF: IO board isn't in sending status
Communication status indicator	Yellow (TX) D36	ON: IO board is sending data to the bus					
		OFF: IO board isn't in sending status					
	Green (TX) D37	ON: IO board is receiving data from the bus					
		OFF: IO board isn't in receiving status					

	B-	Modbus communication signal-	
	+5	Signal power +5V	Communication signal isolating power 5V, 100mA
	SC	Signal ground	Modbus communication signal ground
Grounding terminal	AE	RC grounding terminal	Shielding layer will be grounded via RC loop in the places with long communication line and serious interference
	PE	Direct grounding terminal	Direct grounding, suitable for the places with good grounding condition. Analog and shielding layer of the communication line are grounded.

4.5.4 Control Circuit Wire Specification

600V plastic insulated copper conductor cable is used for control circuit. Specification of wire and tightening torque, see Table 4-16.

Table 4-16 Wire Specification and Tightening Torque

Model	Allowable wire (mm ²)	Recommended wire (mm ²)	Tightening Torque (N.m)
Whole AS180 series	0.75~1	0.75	1.5

The wire sizes are determined under the ambient temperature of 50°C, wire temperature of 75°C.

Control circuit connection is recommended to use bar shaped terminal. Specification of bar shaped terminal, see Table 4-17.

Table 4-17 Specification – Bar shaped terminal

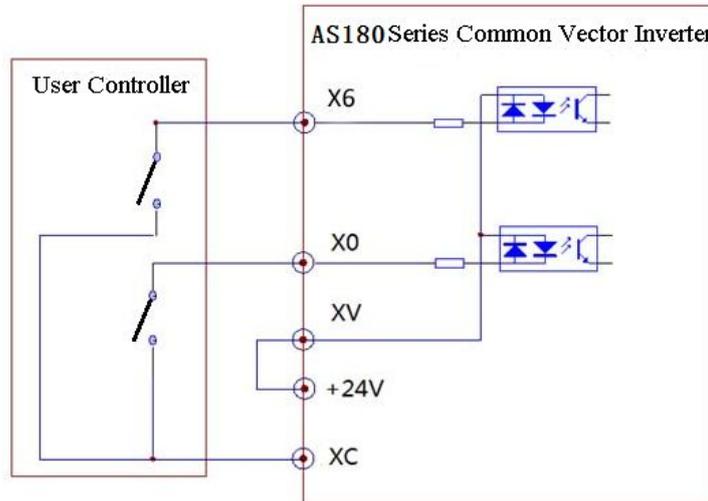
Cross Section area mm ² (AWG)	d1 (mm)	d2 (mm)	L (mm)	Illustration
0.25 (24)	0.8	2	12.5	
0.5 (20)	1.1	2.5	14	
0.75 (18)	1.3	2.8	14	
1.5 (16)	1.8	3.4	14	
2 (14)	2.3	4.2	14	

4.5.5 Detailed Wiring Description for Terminals of the Control Loop

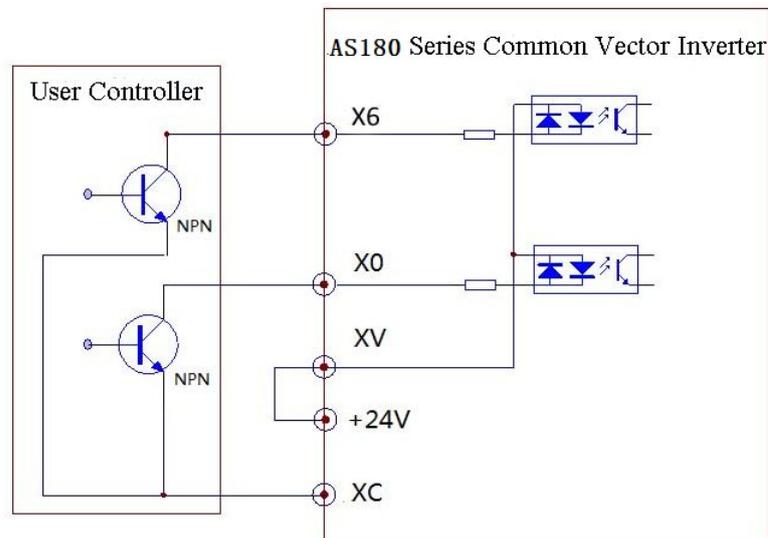
4.5.5.1 Digital Input Terminal

The specific connection mode:

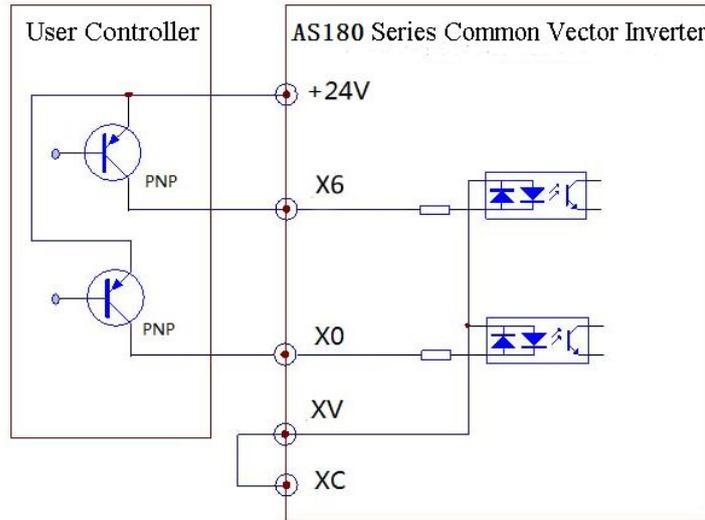
- Use the internal +24V power supply of the inverter, the outer controller is passive contact connection mode



- Use the internal +24V power supply of the inverter, the outer controller is NPN sink current connection mode.

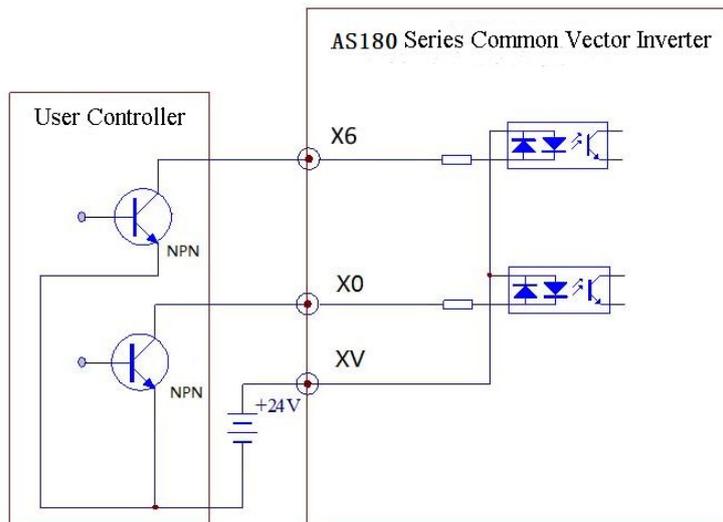


- Use the internal +24V power supply of the inverter, the outer controller is PNP source current connection mode.



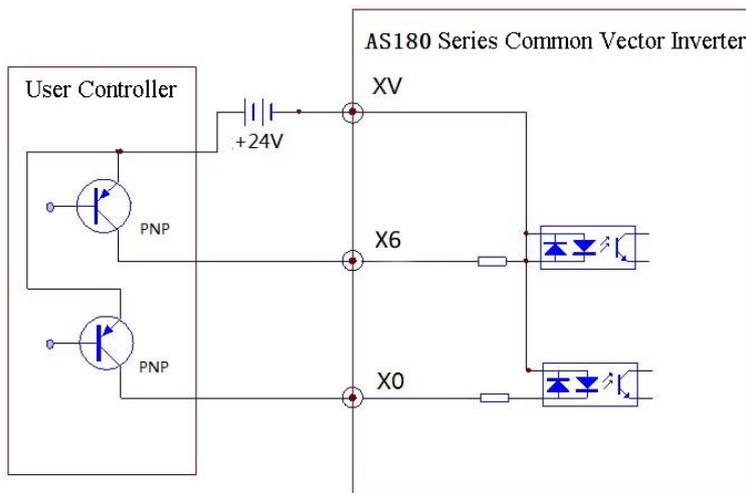
Note: be sure to remove the short circuit lug between terminals +24V and XV, and short connect XC and XV.

- Use the external power supply connection mode, the outer controller is NPN sink current connection mode.



Note: be sure to remove the short circuit lug between terminals +24V and XV.

- Use the external power supply, outer controller is PNP source current connection mode.



Note: Be sure to remove the short circuit lug between terminals +24V and XV.

4.5.5.2 Analog Input Terminal

There are two input ports A0 and A1 for analog signal in this inverter, with signal type of optional voltage/current; voltage signal range $-10V \sim +10V$ and current signal range $0 \sim 20mA$.

When using analog input signals, parameters from P32.00 to P32.11 can be set to select parameters, such as gain, offset, and signal filtering time of each corresponding signal input port, so that analog input port can be use better. Refer to chapter “7.6.3” in detail.

The cable connecting analog signal and inverter should be as short as possible (no longer than 30m) while connecting analog signal, and should use shielded cable. Shielded cable should be grounded and connected to 0V terminal on inverter analog output.

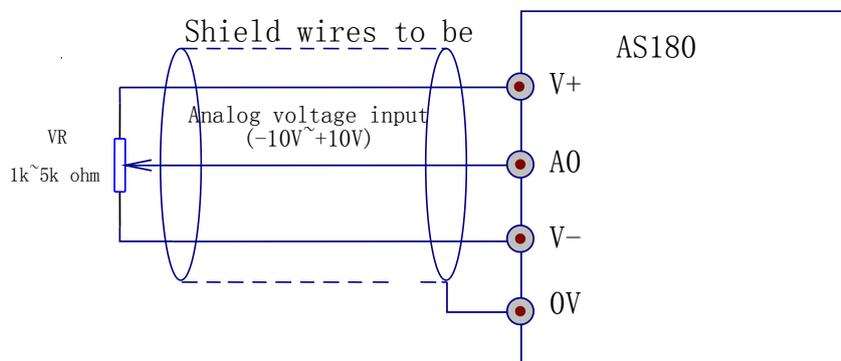


Fig. 4.26 Diagram for analog signal shielded cable connection

In Fig. 4-26, analog voltage signal is supplied by inverter, and its voltage range is $-10V \sim +10V$. In reality, most analog voltage signal is supplied by controller who sends

out analog signal. If it is voltage signal, 0~10V is taken in most cases, the connection diagram, see Fig. 4-27. If it is current signal, 0mA~24mA is taken in most cases, the connection diagram, see Fig. 4-28.

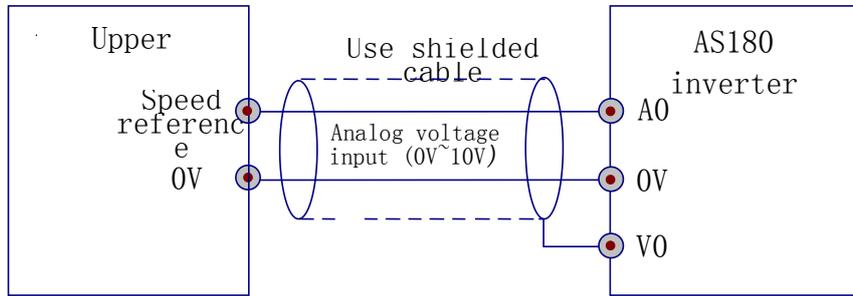


Fig. 4.27 Diagram for AIO cable connection with voltage signal

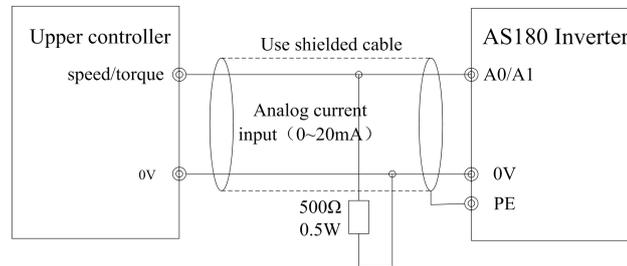


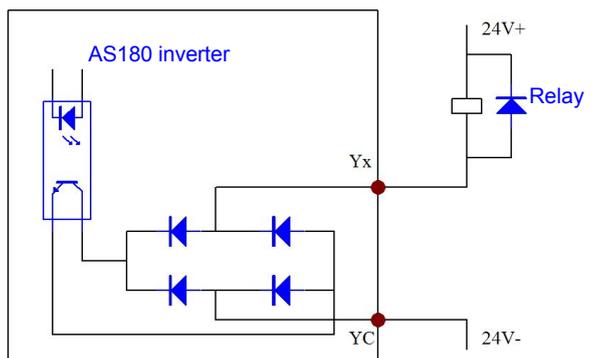
Fig. 4.28 Diagram for AIO cable connection with current signal

4.5.5.3 Digital Output Terminal

Digital output terminal has two parts, relay contact output terminal and open collector output terminal. Each digital output terminal can define input function by setting parameter based on function code P31. The value of code P31 ranges from 0 to 63. Each number refers to Parameter group P31.

Notice: Open collector output uses the external power supply, note the polarity of the power supply for connection to the external power supply. The output of the specifications of the power supply for the maximum voltage + 30 VDC, maximum load current 50 mA, beyond which specification is in danger of damage output circuit.

- Use the external +24V power supply of the inverter, multifunctional collector open output terminal connection mode



Note: if terminal Y0 or Y1 is damaged when this wiring mode is adopted, be sure to confirm whether polarity of the outer diode is correct.

4.5.5.4 Multi-function Analog Output Terminal

Multi-function analog output can define input function by setting parameter based on function code P33.00 and P33.03. The value of code ranges from 0 to 16. Each number refers to the following function and the corresponding output (P33.00 refers to M0, P33.03 refers to M1):

- no definition;
- 1: output current;
- 2: output voltage;
- 3: torque given ;
- 4: busbar voltage;
- 5: output total power;
- 6. output active power;
- 7: speed(unsigned);
- 8: given speed (signed);
- 9: feedback of speed regulator(signed);
- 10: heating rate
- 11: radiator temperature
- 12: Analog A0
- 13: Analog A1
- 14: Analog A2
- 15: Modbus Analog output0
- 16: Modbus Analog output1

See chapter 7, “7.6.4 Analog output function Parameter I” for more information.

4.5.6 Other Remarks for Wiring

Control terminal wiring must keep far away from power cable in main circuit, or wrong action may be triggered due to the electromagnetic interference.

Chapter 5 Commissioning and Test Run

In the following chapters, noun description relating to control, running and status of the inverter will be mentioned many times. Please carefully read the contents in this chapter prior to use of the product, to correctly understand and properly use the functions mentioned in later chapters.

Danger

Close input power only after the inverter casing has been installed. After electrification, don't remove the inverter casing, otherwise it may cause electric shock.

If restart for outage function is set for the inverter, don't close to the rotating mechanical equipment, to avoid personal injury caused by starting the mechanical equipment when the inverter is powered on.

Don't touch the braking resistor when dynamic braking resistor is provided, otherwise it may cause electric shock or burn.

Please be sure to confirm the permissible application scope of the motor and mechanical equipment before the inverter starts the motor and mechanical equipment, otherwise it may cause personal injury.

Notice

Don't examine the measurement signal when the inverter is running, otherwise it may cause equipment damage.

Be sure not to change the parameter setting of the inverter at will, otherwise the proper operation effect can't be met, with damage to the transmission equipment.

Be sure to have switching commissioning firstly before run command channel of the inverter is switched, otherwise it may cause equipment damage and personal injury.

5.1 Run Command Given

As a basic tool for the inverter operation, manipulator is used to observe different status and fault code of the inverter, as well as set and view its various parameters. In this chapter, basic operation method of the manipulator is described in details.

5.1.1 Run Command Channel of the Inverter

It assigns the inverter to receive run command: physical channel for start, stop and so on. The run command channels are divided into:

Operation panel: control by use of RUN, STOP and LOC/REM keys on it

Control terminal: control by use of control terminals X0~X6 (digital) and A0~A1 (analog)

Communication port: start and stop the control by use of control terminals A+ and B- (Modbus) with upper computer.

Selection of command channel can be set through function code P10.02.

Note: before the command channel is switched, be sure to have switching commissioning firstly, otherwise it may cause equipment damage and personal injury.

5.1.2 Frequency Given Channel of the Inverter

There are 4 frequency given physical channels when AS180 is in normal operation mode:

Operation panel ▲ and ▼ keys given,

Terminal given,

Communication given,

Analog voltage or current given.

5.1.3 Working Status of the Inverter

Working status of AS180 includes stop status and running status.

Stop status: after the inverter is powered on and initialized, if no any run command is input or stop command is executed during running, then it will enter stop status immediately.

Running status: the inverter will enter running status after it receives run command.

5.1.4 Run Mode of the Inverter

Inching run shares the highest priority.

Closed loop run: selection function of the closed loop is effective (P51.00=1). The inverter will choose closed loop run mode, to have PID regulation based on given and feedback quantity (refer to function code in P51 group).

Multi-speed run: select multi-frequency 0 ~ 7 (P41.00 ~ P41.07) by use of combined open/close the multifunctional terminals (functions 3, 4 and 5) to realize multi-speed run.

Normal run: the simple open loop run mode.

5.2 Operation Guide

As a basic tool for the inverter operation, manipulator is used to observe different status and fault code of the inverter, as well as set and view its various parameters. In this chapter, basic operation method of the manipulator is described in details.

The user can execute the following through the operation panel:

- Motor status monitoring
- Motor self-tuning
- Motor run control (start/stop, speed, forward/reverse)
- View and answer the fault or alarm
- Set and modify the parameters
- Switching between local mode and remote mode

5.2.1 Function for Individual Parts of the Operator

Refer to the Fig. 5-1 for each parts of operator and its function.

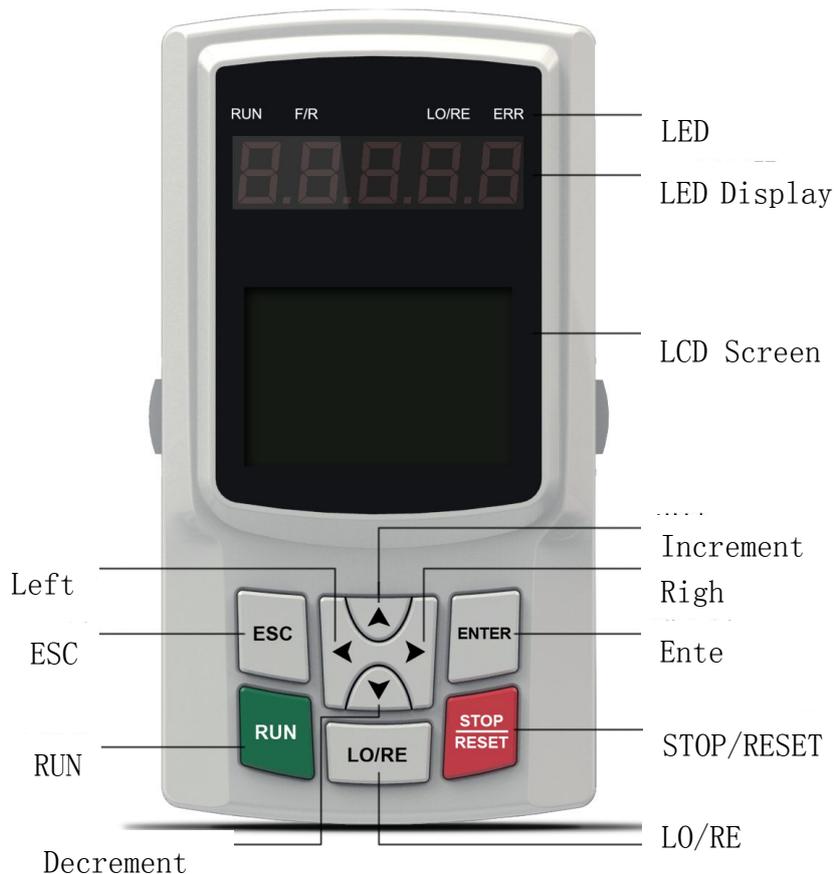


Fig. 5-1 Names and functions of each parts of the operator

5.2.2 LED Indicator

The operator have 4 LED indicators, D1 (RUN), D2 (F/R), D3 (LO/RE) and D4 (ERR). These indicators show the motor status. Refer to Table 5-1 for the relationships between indicators and motor status.

Table 5-1 Motor status indication

Status	D1 (RUN)	D2 (F/R)	D3 (LO/RE)	D4 (ERR)
Forward	On	On	Off	Off
Reverse	On	Off	Off	Off
Fault/Warning	Off	—	—	Flashing
Panel operation	On	On/off	On	Off

5.2.3 LED Digital Tube

There are 4 LED digital tubes below the indicators and displaying real time motor speed at the default interface. The content of display can be changed by selecting different parameters.

5.2.4 LCD Display

In middle of operator you can find a LCD screen. This is the main screen to display and set the parameter of the inverter, and to view the fault code of the inverter.

5.2.4 Keyboard

There are 9 keys at lower part of the operator. Function of those keys, see Table 5-2

Table 5-2 Key function

Key	Name	Function
	Right	In 【Function Select】 mode: To select the next function group; In 【Parameter setting】 mode: To move the cursor to the right;
	Left	In 【Function Select】 mode: To select the previous function group; In 【Parameter setting】 mode: To move the cursor to the left;
	Increment	In 【Function Select】 mode: To select the previous function code; In 【Parameter setting】 mode: To increase the value;
	Decrement	In 【Function Select】 mode: To select the next function code; In 【Parameter setting】 mode: To decrease the value;
	Enter	In 【Monitoring】 mode: To enter the function selecting interface; In 【Function Select】 mode: To enter the selected function interface;
	ESC	In 【Function Select】 mode: back to 【Monitoring】 mode; In all operational sites: back to 【Function Select】 mode.

RUN	RUN	In LOCAL control mode: “RUN” function;
STOP RESET	STOP/RESET	In LOCAL control mode: “STOP” function; In Fault stop status: “RESET” function
LO/RE	LO/RE	Operation mode switch between operator (LOCAL) and control circuit terminal (REMOTE).

5.3 Operation

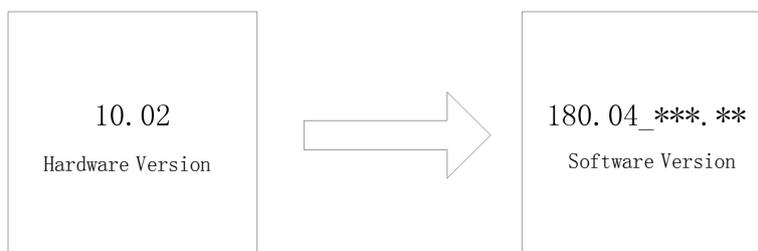
Monitoring status, function selection and parameter setting are provided on the operator. Menu of the operator is displayed in Chinese and English, which is set as Chinese at factory, but it may be switched to English by setting the parameter value in “language selection” of the advanced menu.

5.3.1 Power On and Initialization

When the operator is powered on for the first time, it needs to adjust brightness of the operator LCD via left shift key and right shift key, with the former to reduce brightness, while the latter to increase brightness.

After the operator is powered on, there is several seconds for its initialization. During this process, operator LCD will display [startup picture].

Startup picture is as the following:



Note: the screen enters monitoring status after the software version number is displayed.

5.3.2 Display After Power On

Screen shows “Monitoring” state 5 seconds after power on. The screen default displays the current reference speed (Vref), feedback speed (Vfbk) and current states (Irms).

5.3.3 【Monitor State】 In Detail

Monitoring interface can be switched by pressing  , or   in 【Monitor State】. 14 real time data of motor status are displayed in screen by default. These data is for display only but can't be modified.

Table 5-3 Comparison table for default operation data

Display	Name	Explanation	Unit
Vobj	Target speed	Display the target speed of the motor	rpm
Vref	Given speed	Display the given speed	
Vfbk	Feedback speed	Display feedback speed of the motor	rpm
Irms	Output current	Display output current	A
Torq	Output torque	Display output torque	%
Tzero	Zero servo torque	Display zero servo torque at starting	%
Udc	DC Bus voltage	Display DC voltage of inverter main circuit	V
Uout	Output voltage	Display inverter output voltage	V
A0	A0 input voltage	Display input voltage of inverter analog input 0 (A0)	V
A1	A1 input voltage	Display input voltage of inverter analog input 1 (A1)	V
M0	M0 output voltage	Display output voltage of inverter analog output 1 (M0)	V/m A
M1	M1 output voltage	Display output voltage of inverter analog output 1 (M1)	V/m A
PIDRef	Process closed loop PID given	Display the current PID given value	V (default)
PIDFbk	Process closed loop PID feedback	Display the current PID feedback value	V (default)
DI	Input X0-X7 status	Display the input status of terminals X0-X6, as "XXXXXXXX", where "X" = 0, indicating no input, "X" = 1, indicating input	×
DO	Output K1-K4 and Y0、Y1 status	Display the output status of terminals K1-K4, Y0, Y1, as "XXXXXX", where "X" = 0, indicating no output, "X" = 1, indicating output	×

5.3.4 【Control Panel】 In Detail

Press **LO/RE** in “Monitoring” interface can switch operation mode between “Monitoring” and “Control Panel”. In “Control Panel” mode LED indicator D3 will be on. Press **RUN** at that time may control inverter into operation state, LED indicator D1 in operator will be on. Inverter enters in stop state by pressing **STOP RESET**, LED indicator D1 will be off. Press  and  in “Control Panel” interface can switch the monitored contents. In this interface there are 2 panel adjustable parameters and 4 real time operation data. Panel adjustable speed (Vref) and motor moving direction (Vdir) can be modified, other 4 data are displayed only but can't be modified.

Table 5-4 Comparison table for control panel data

Display	Name	Explanation	Range	Unit	Factory Default	Remarks
Vref	Panel controlled speed	Set speed reference in panel operation	0.00~ 50.00	Hz	5.00	
Vfbk	Feedback speed	Display motor feedback speed	×	Hz	×	
Irms	Output current	Display output current	×	A	×	
Vdir	Motor moving direction	Set motor rotating to forward or reverse direction	0~1	×	1	
Udc	DC Bus voltage	Display DC voltage of inverter main circuit	×	V	×	
Uout	Output voltage	Display inverter output voltage	×	V	×	

5.3.5 Operation Mode

Operator has 5 operating modes. They are **【Parameter Setting】**, **【Motor Tuning】**, **【Fault Check】**, **【Parameter Processing】** and **【Modified Parameters】**. In any monitoring interface, press **ENTER** can enter into following “Function Select” interface:

- * 1: Parameter Setting
- 2: Motor Tuning
- 3: Fault Check
- 4: Parameter Processing
- 5: Modified Parameters

5.3.5.1 【Parameter Setting】

Parameters are modified in **【Parameter Setting】** mode. The setting range of parameter refers to chapter 6.

In **【Parameter Setting】** mode, to select parameter group by pressing  or , select parameter code by pressing  or . Press  to confirm the parameter to be modified. A cursor that indicates the position to be modified is displayed on selected parameter. Press  or  to move the cursor and change the modified position, press  or  to increase/decrease the modified value. Then press  to confirm the modification, modification is invalid if  is not pressed. Press  and return to previous menu.

5.3.5.2 **【Motor Tuning】**

- 1: Parameter Setting
- * 2: Motor Tuning
- 3: Fault Check
- 4: Parameter Processing
- 5: Modified Parameters

In **【Motor Tuning】** mode, the parameters for motor (asynchronous) and encoder phase angle can be retrieved manually by self-learning. Self-learning mode can be selected by modifying X value in ATun = X. Press , a cursor is displayed on the parameter to be modified. Press  or  to select self-learning mode. Then press  to confirm. There are 7 self-learning modes. They are:

- 0: normal operation
- 1: static encoder self-learning
- 2: encoder modification
- 4: Parameter reset
- 5: Fault reset

Press  and return to previous menu.

5.3.5.3 **【Fault Check】**

- 1: Parameter Setting
- 2: Motor Tuning
- * 3: Fault Check
- 4: Parameter Processing

5: Modified Parameters

In **【Fault Check】** mode, records of voltage, current, speed reference, feedback speed and content for latest 8 faults are displayed. In main interface, press **ENTER** to display ER0=X, then press **▲** or **▼** and display changes from ER0 to ER7. ER0 is the latest fault, ER7 is the earliest one. X stands for the fault code in current fault index. The explanation of this fault is displayed underneath at the same time. Press on more time **ENTER** in fault code display screen, current DC Bus voltage (Ude), output current (Irms), speed reference (Vref) and feedback speed (Vfbk) are displayed. Press **ENTER** again and return to fault code display screen. Press **ESC** and return to previous menu.

5.3.5.4 **【Parameter Processing】**

- 1: Parameter Setting
- 2: Motor Tuning
- 3: Fault Check
- * 4: Parameter Processing
- 5: Modified Parameters

In **【Parameter Processing】** mode, parameter can be uploaded, downloaded, initialized, cleared. To select proper operation mode by modifying X value in Init = X.

Press **ENTER**, a cursor is displayed on the parameter to be modified in position X. press **▲** or **▼** to select proper operation mode. Then press **ENTER** to confirm. There are 4 parameter processing modes. They are:

- 1: upload parameter to operator
- 2: download parameter to inverter
- 7: parameter reset
- 8: fault reset

Press **ESC** and return to previous menu.

5.3.5.5 **【Modified Parameters】**

- 1: Parameter Setting
- 2: Motor Tuning
- 3: Fault Check

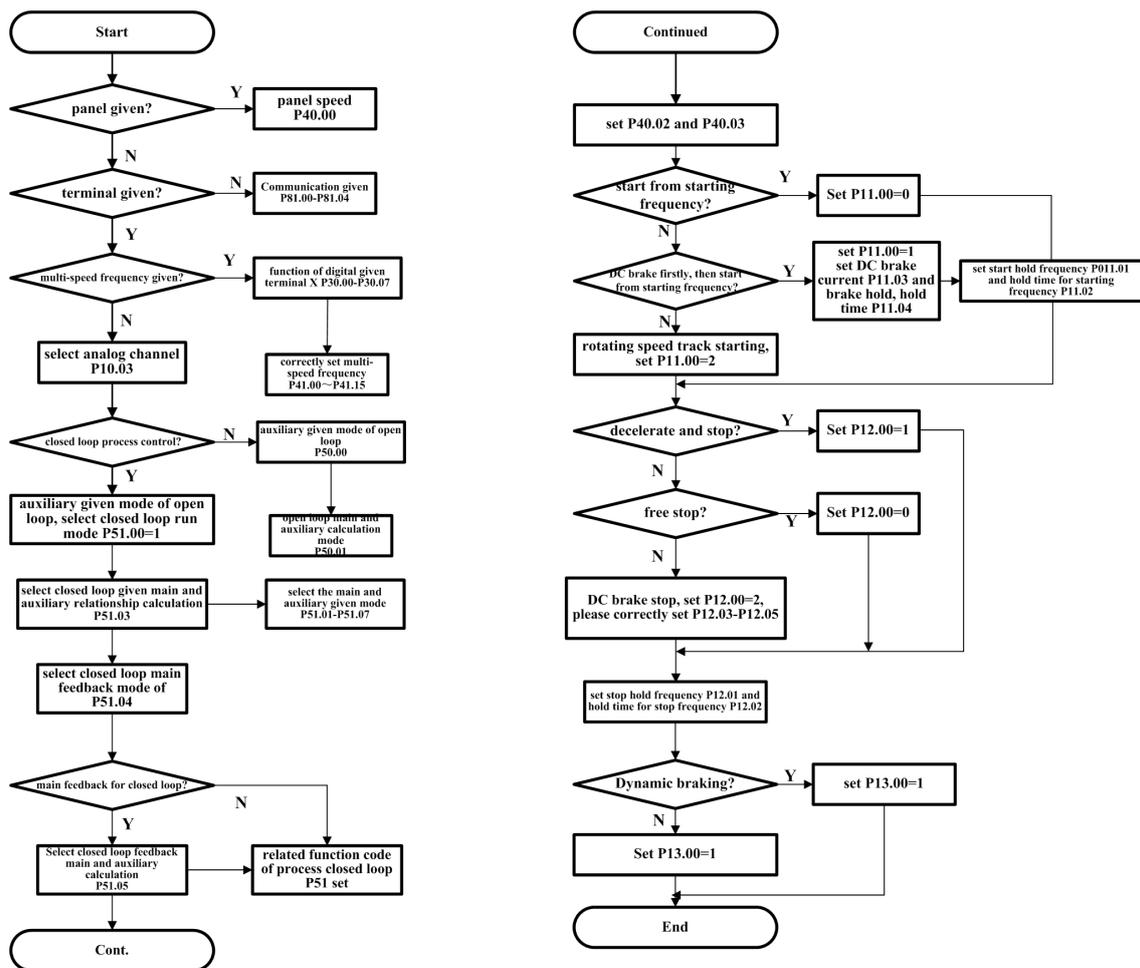
4: Parameter Processing

* 5: Modified Parameters

In **【 Modified Parameters 】** could Inquire and modify the recently modified parameters. Select the parameter code in parameter set via  or , then press , a cursor indicating modified bit will be shown on the parameter bit to be modified. After that, change the modified bit with  or , and plus or minus the value with  or . Finally press  to confirm the modification, otherwise it will be invalid.

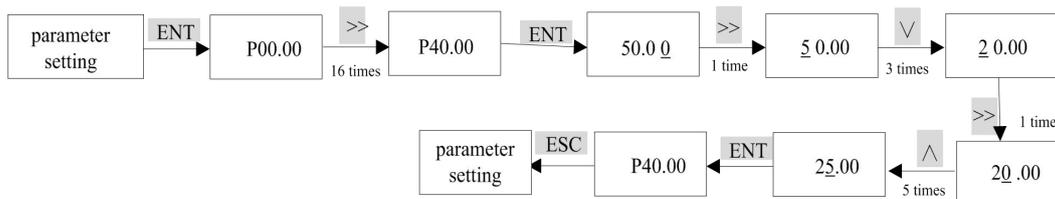
Press  to return to the previous menu.

5.4 Fast Commissioning for V/F Control



5.5 Operation Example

In the following example, stop display parameter is the setting frequency, which is 50.00Hz at factory. Those underlined are the current editing bit. Set the setting frequency, for example, P40.00 = 25.00Hz.



5.6 Fault Display

When inverter has fault, fault indicator D4 on top of operator will blink. LED tube light will display real-time fault code. Table 5-5 lists fault codes and names.

Table 5-5 Table of fault code & name

Fault code	Fault description	Fault code	Fault description
1	Module overcurrent protection	2	ADC fault
3	Heatsink overheat	4	Brake unit fault
5	Fuse break fault	6	Output torque overload
7	Speed deviation	8	DC bus over-voltage protection
9	DC bus under-voltage	10	Output phase loss
11	Motor overcurrent at low speed	12	Encoder fault
13	Current detected while stop	14	Speed reversed direction in running
15	Speed detected while stop	16	Wrong motor phase
17	Overspeed in the same direction	18	Overspeed in the opposite direction

Fault code	Fault description	Fault code	Fault description
19	Wrong phase sequence of UVW encoder	20	Encoder communication fault
21	abc overcurrent	22	Brake detection trouble
23	Input overvoltage	24	Spare
27	Output overcurrent	28	SIN/COS encoder fault
29	Input phase loss	30	Overspeed protection
31	Motor high speed overcurrent	32	Ground protection
33	Aging capacitor	34	External fault
35	Output unbalance	36	Wrong parameter setting
37	Current sensor fault	38	Braking resistor short circuit
39	Too large instant current	40	Faulty output contactor
41	Brake detection fault	42	IGBT short fault
43	Communication fault	44	Abnormal input power
47	Abnormal analog input	48	Disconnected temperature sampling
49	PT detection fault	50	Humidity fault
51	Abnormal running output current	52	PTC high temperature alarm
53	Master control board error	56	Motor fan exception

Chapter 6 Functional Parameter Table

6.1 Introduction to Function Code Parameters Table

Simple table field	Description
Function code symbol	Function code symbol, for example P00.00
Function code name	Name of function code, to explain its roles
Factory default	Function code set value after reset to factory default operation (see P00.01)
Setting range	The minimum and maximum value set permitted by function code
Unit	V: voltage; A: current; °C: degree; Ω: ohm,; mH: millihenry rpm: rotating speed %: percentage; bps: baud rate; Hz, kHz: frequency; ms, s, min, h, kh: time; kW: power; /: no unit, etc
Properties	○: modifiable during running; ×: modifiable only during stop; *: read-only parameter, unchangeable
Function code option	List of function code parameter setting
User setting	Parameter record by the user

6.2 Simple Table of Function Code Parameters

6.2.1 Group P0X User Parameters

Group P00 Password Parameter						
Function code	Function code name	Factory default	Setting range	Unit	Properties	Option description
P00.00	Login password	0	0~65535	/	×	0: no password; other: login password;
P00.01	Modify password	0	0~65535	/	×	0: no password; other: password protection;
P00.02	Reserved password	0	0~65535	/	×	Reserved
Group P01 Customer parameter						
Group P02 Special functional parameter						

6.2.2 Group P1X Control Parameters

6.2.2.1 Group P10 Basic Control Parameters

Function code	Function code name	Factory default	Setting range	Unit	Properties	Option description
P10.00	Control mode selection	0	0~5	/	×	0: Voltage vector V/f control
						1~4: Spare
						5: Vector control 1 without speed sensor
P10.01	Operating mode selection	0	0~4	/	×	0: 2-wire 1; 1: 2-wire 2; 2: 3-wire 1; 3: 3-wire 2; 4: 1-wire Operating mode
P10.02	Run command given mode selection	0	0~5	/	×	0: panel 1: terminal 2: communication (Modbus) 3: CAN given 4: Profibus_DP given 5: PLC given (with optional programmable IO control board)
P10.03	Frequency/speed given mode 1	0	0~16	/	×	0: given ▲ and ▼ for panel frequency
						1: digital multi-speed given target speed
						2: spare
						3: analog 0 given target speed
						4: analog 0 given current speed
						5: analog 1 given target speed
						6: analog 1 given current speed
						7: communication (Modbus) given current speed
						8: PID given target speed
						9: reserved
						10: reserved
						11: reserved
						12: communication (Modbus) given target speed
						13: CAN given current speed
14: CAN given target speed						

Function code	Function code name	Factory default	Setting range	Unit	Properties	Option description
						15: Up/Down given speed
						16: Profibus_DP given speed
P10.06	Speed limit selection	0	0~5	/	×	0: internal parameter limit 1: analog 0 limit 2: analog 1 limit 3: analog 2 limit 4: ModBus communication limit 5: automatic limit
P10.07	Frequency/speed given mode 2	0	0~16	/	×	As P10.03

6.2.2.2 Group P11 Starting Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P11.00	Starting mode	0	0~2	/	×	0: normal start 1: restart after DC braking 2: speed track start
P11.01	Start holding frequency	0.00	0.00~30.00	Hz	×	
P11.02	Holding time of starting frequency	0.0	0.0~3600.0	s	×	
P11.03	Starting DC injection current	30.0	0.0~120.0	%	×	
P11.04	Starting DC injection time	5.0	0.0~99.9	s	×	
P11.05	Excitation time	0.0	0.0~99.9	s	×	
P11.06	Zero servo time	0.0	0.0~99.9	s	×	
P11.07	Brake actuation time	0.20	0.00~99.99	s	×	
P11.08	Track delay time	1000	0~65535	ms	×	
P11.09	Track zero voltage time	100	0.0~65535	ms	×	
P11.10	Tracking voltage Kp	0.20	0.00~6553.50	/	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P11.11	Tracking voltage Ki	0.30	0.00~ 6553.50	/	×	
P11.12	Tracking voltage Kd	0.00	0.00~ 6553.50	/	×	
P11.13	Track exit delay	1000	0~65535	ms	×	
P11.14	Maximum current during track	100.0	0~200.0	%	×	
P11.15	Tracking frequency change gain	10.0	0~100.0	%	×	
P11.16	Maximum voltage during track	0	0~65535	V	×	
P11.17	Initial tracking frequency	50.00	0.00~ 100.00	Hz	×	
P11.18	Maximum current during track	0.0	0~6553.5	A	×	
P11.19	Reverse braking current	20.0	0.0~ 100.0	%	×	

6.2.2.3 Group P12 Parking Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P12.00	Parking mode	0	0~4	/	×	0: inertia parking
						1: decelerate parking
						2: deceleration + DC braking
						3: deceleration + holding excitation
						4: deceleration+ holding torque
P12.01	Parking holding frequency	0.00	0.00~ 300.00	Hz	×	
P12.02	Parking frequency holding time	0.0	0.0~99.9	s	×	
P12.03	DCbraking initial frequency	2.50	0.00~ 10.00	Hz	×	
P12.04	Parking DC braking current	50. 0	0.0~ 100.0	%	×	
P12.05	Parking DC braking time	0.5	0~10.0	s	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P12.06	Parking excitation holding time	0	0~65535	s	×	

6.2.2.4 Group P13 Braking Function Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P13.00	Dynamic braking selection	1	0~1	/	×	0: turn on dynamic braking 1: not turn on dynamic braking Built-in braking unit, default 0
P13.01	Braking turning-on voltage	660	620~750	V	×	
P13.02	Braking unit service time	60.0	0.0~300.0	s	×	

6.2.2.5 Group P14 V/F Control Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P14.00	V/F curve setting	0	0~4	/	×	0: standard V/F straight line;
						1: 1.2-power curve
						2: 1.5-power curve
						3: second power curve
						4: user defined
P14.01	V/F voltage value V0	76	0.0~460.0	V	×	
P14.02	V/F frequency value F0	10.00	0.00~300.00	Hz	×	F0<F1
P14.03	V/F voltage value V1	152	0.0~460.0	V	×	
P14.04	V/F frequency value F1	20.00	0.00~300.00	Hz	×	F1<F2
P14.05	V/F voltage value V2	228	0.0~460.0	V	×	
P14.06	V/F frequency value F2	30.00	0.00~300.00	Hz	×	F2<F3
P14.07	V/F voltage value V3	304	0.0~460.0	V	×	
P14.08	V/F frequency value	40.00	0.00~	Hz	×	F3<F4

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
	F3		300.00			
P14.09	V/F voltage value V4	380	0.0~ 460.0	V	×	
P14.10	V/F frequency value F4	50.00	0.00~ 300.00	Hz	×	

6.2.3 Group P2X Motor Parameters

6.2.3.1 P20 Basic Motor Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P20.00	Type of motor 1	0	0	/		0: asynchronous
P20.01	Rated power of motor 1	As per the inverter power	0~ 655.35	kW	×	Set as per the motor nameplate
P20.02	Rated current of motor 1	As per the inverter current	0.1~ 999.9	A	×	Set as per the motor nameplate
P20.03	Rated frequency of motor 1	50.00	0.00~ 300.00	Hz	×	Set as per the motor nameplate
P20.04	Rated speed of motor 1	1460	0~ 30000	rpm	×	Set as per the motor nameplate
P20.05	Rated voltage of motor 1	380	0~460	V	×	Set as per the motor nameplate
P20.06	Number of poles of motor 1	4	2~128	/	×	Number of pole-pair of motor=poles/2
P20.07	Rated slip frequency of motor 1	1.40	0.10~ 655.35	Hz	×	Set as per the motor nameplate
P20.08	Maximum slip frequency of motor 1	2.80	0.10~ 655.35	Hz	×	
P20.09	Phase sequence of motor 1	1	0~1	/	×	0: negative phase sequence; 1: positive phase sequence
P20.10	No-load current coefficient of motor 1	30.00	0.10~ 60.00	%	×	
P20.11	Motor rated torque	450.0	0.0~ 6553.5	Nm	×	Set as per the motor nameplate

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P20.12	Maximum power factor of motor 1	250	50~400	%	×	
P20.13	Maximum power of motor 1	50.00	0.00~300.00	Hz	×	
P20.14	Type of motor 2	0	0	/		0: asynchronous
P20.15	Rated power of motor 2	As per the inverter power	0~655.35	kW	×	Set as per the motor nameplate
P20.16	Rated current of motor 2	As per the inverter current	0.1~999.9	A	×	Set as per the motor nameplate
P20.17	Rated frequency of motor 2	50.00	0.00~300.00	Hz	×	Set as per the motor nameplate
P20.18	Rated speed of motor 2	1460	0~30000	rpm	×	Set as per the motor nameplate
P20.19	Rated voltage of motor 2	380	0~460	V	×	Set as per the motor nameplate
P20.20	Number of poles of motor 2	4	2~128	/	×	Number of pole-pair of motor=poles/2
P20.21	Rated slip frequency of motor 2	1.40	0.10~655.35	Hz	×	Set as per the motor nameplate
P20.22	Maximum slip frequency of motor 2	2.80	0.10~655.35	Hz	×	
P20.23	Phase sequence of motor 2	1	0~1	/	×	0: negative phase sequence; 1: positive phase sequence
P20.24	No-load current coefficient of motor 2	30.00	0.00~60.00	%	×	
P20.25	Maximum power factor of motor 2	450.0	0.0~6553.5	%	×	
P20.26	Maximum frequency of motor 2	250	50~400	Hz	×	

Note 1: different inverter power corresponds to different default value.

6.2.3.2 P21 Advanced Motor Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P21.01	Stator resistance of motor 1	0.628	0.000~ 65.000	Ω	×	
P21.02	Rotor resistance of motor 1	0.441	0.000~ 65.000	Ω	×	
P21.03	Stator inductance of motor 1	0.1028	0.0000 ~ 6.0000	H	×	
P21.04	Rotor inductance of motor 1	0.1028	0.0000 ~ 6.0000	H	×	
P21.05	Mutual inductance of motor 1	0.0991	0.0000 ~ 6.0000	H	×	
P21.06	Stator resistance of motor 2	0.060	0.000~ 65.000	Ω	×	
P21.07	Rotor resistance of motor 2	0.045	0.000~ 65.000	Ω	×	
P21.08	Stator inductance of motor 2	0.0178	0.0000 ~ 6.0000	H	×	
P21.09	Rotor inductance of motor 2	0.0178	0.0000 ~ 6.0000	H	×	
P21.10	Mutual inductance of motor 2	0.0178	0.0000 ~ 6.0000	H	×	

6.2.3.3 P23 Motor Protection Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P23.00	Motor overheat protection selection	0	0~2	/	×	0: no protection 1: input via analog A0 2: input via analog A1
P23.01	Motor sensor protection threshold value	5.000	0.000~ 10.000	V	×	0.00~10.00V
P23.02	Motor overcurrent protection time	60.0	0.5~ 300.0	s	×	
P23.03	Motor low speed overcurrent	150.00	0.00~ 150.00	%	×	20% rated speed and below

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
	threshold value					
P23.04	Motor low speed overcurrent time	60.0	0.1~120.0	s	×	
P23.05	Motor high speed overcurrent threshold value	120.00	0.00~150.0	%	×	20% rated speed and above
P23.06	Motor high speed overcurrent time	30.0	0.1~60.0	s	×	

6.2.4 Group P3X Digital Parameters

6.2.4.1 P30 Digital Input Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P30.00	Input function selection of terminal X0	7	0~63	/	×	Refer to Chapter 7 "Parameter Details".
P30.01	Input function selection of terminal X1	8	0~63	/	×	
P30.02	Input function selection of terminal X2	0	0~63	/	×	
P30.03	Input function selection of terminal X3	0	0~63	/	×	
P30.04	Input function selection of terminal X4	0	0~63	/	×	
P30.05	Input function selection of terminal X5	0	0~63	/	×	
P30.06	Input function selection of terminal X6	0	0~63	/	×	
P30.07	Input function selection of terminals P1-P2	0	0~1	/	×	
P30.08	Input filter times of X0 ~ X6 and P1-P2	5	0~100	per	×	Default high level, which is reduced with over temperature signal

6.2.4.2 P31 Digital Output Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P31.00	Output K1 function definition	2	0~63	/	×	Refer to Chapter 7 “Definition table of multifunctional output terminals in group P31”
P31.01	Output K2 function definition	25	0~63	/	×	
P31.02	Output K3 function definition	0	0~63	/	×	
P31.03	Output K4 function definition	0	0~63	/	×	
P31.04	Terminal Y0 output function definition	0	0~63	/	×	
P31.05	Terminal Y1 output function definition	0	0~63	/	×	
P31.06	Relay K1 terminal action relay	0.0	0.0~60.0	S	×	
P31.07	Relay K1 terminal reset relay	0.0	0.0~60.0	S	×	
P31.08	Relay K2 terminal action relay	0.0	0.0~60.0	S	×	
P31.09	Relay K2 terminal reset relay	0.0	0.0~60.0	S	×	
P31.10	Relay K3 terminal action relay	0.0	0.0~60.0	S	×	
P31.11	Relay K3 terminal reset relay	0.0	0.0~60.0	S	×	
P31.12	Relay K4 terminal action relay	0.0	0.0~60.0	S	×	
P31.13	Relay K4 terminal reset relay	0.0	0.0~60.0	S	×	
P31.14	Terminal Y0 action delay	0.0	0.0~60.0	S	×	
P31.15	Terminal Y0 reset delay	0.0	0.0~60.0	S	×	
P31.16	Terminal Y1 action delay	0.0	0.0~60.0	S	×	
P31.17	Terminal Y1 reset delay	0.0	0.0~60.0	S	×	
P31.20	Non zero current detection width	4.0	0.0~50.0	%	×	
P31.21	Frequency arrive detection width	1.00	0.0~300.00	Hz	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P31.22	Detection frequency	1.00	0.00~300.00	Hz	×	For frequency detection function
P31.23	Detection frequency width	0.20	0.00~300.00	Hz	×	For frequency detection function
P31.24	Single run time arrive	2	0~65535	h	×	
P31.25	Accumulated run time arrive	8	0~65535	h	×	
P31.26	Frequency detection 3 upper limit	0.00	0.00~300.00	Hz	×	Details Refer to Chapter 7
P31.27	Frequency detection 3 lower limit	0.00	0.00~300.00	Hz	×	
P31.28	Frequency detection 4 upper limit	0.00	0.00~300.00	Hz	×	
P31.29	Frequency detection 4 lower limit	0.00	0.00~300.00	Hz	×	
P31.30	Frequency detection 5 upper limit	0.00	0.00~300.00	Hz	×	
P31.31	Frequency detection 5 lower limit	0.00	0.00~300.00	Hz	×	

6.2.4.3 P32 Analog Input Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P32.00	A0 input type	1	0~3	/	×	0: 0V ~ 10V 1: -10V ~ 10V 2: 0 ~ 20mA 3: 4 ~ 20mA Note: it depends on I/O board type.
P32.01	A0 input function selection	0	0~6	/	×	0: no function 1: target speed signal 2: current speed signal 3: torque signal 4: compensating torque signal 5: speed limit signal 6: PTC temperature signal
P32.02	A0 offset	-0.10	-100.00~327.67	%	°	
P32.03	A0 gain	100.0	0.0~6553.5	%	°	

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P32.04	A0 filtering time	10	0~65535	ms	×	When PTC temperature signal is chosen, default 2000ms
P32.05	A0 amplitude limit	10.000	0.000~10.000	V/mA	×	It is set as 20.000mA, if current type input is chosen.
P32.06	A1 input type	1	0~3	/	×	0: 0V ~ 10V 1: -10V ~ 10V 2: 0 ~ 20mA 3: 4 ~ 20mA Note: it depends on IO board type.
P32.07	A1 input function selection	0	0~6	/	×	As A0
P32.08	A1 offset	-0.10	-100.00~327.67	%	。	
P32.09	A1 gain	100.0	0.0~6553.5	%	。	
P32.10	A1 filtering time	10	0~65535	ms	×	When PTC temperature signal is chosen, default 2000ms.
P32.11	A1 amplitude limit	10.000	0.000~10.000	V/mA	×	It is set as 20.000mA, if current type input is chosen.

6.2.4.4 P33 Analog Output Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P33.00	M0 output function selection	1	0~16	/	×	Refer to chapter 7 “Parameter details
P33.01	M0 offset	50.10	-100.00~327.67	%	×	
P33.02	M0 gain	98.5	0.0~6553.5	%	。	
P33.03	M1 output function selection	2	0~16	/	×	Refer to chapter 7 “Parameter details
P33.04	M1 offset	50.10	-100.00~327.67	%	。	
P33.05	M1 gain	98.5	0.0~6553.5	%	。	
P33.06	M0 output type	0	0~4	/	×	1: 0~10V 2: -10V~+10V 3: 0~20mA 4: 4~20mA

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P33.07	M1 output type	0	0~4	/	×	1: 0~10V 2: -10V~+10V 3: 0~20mA 4:4~20mA

6.2.5 Group P4X Speed Control Parameters

6.2.5.1 P40 Basic Speed Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P40.00	Panel speed	5.00	0.0~300.00	Hz	×	
P40.01	Basic frequency	50.00	0.0~300.00	Hz	×	
P40.02	Acceleration time 0	5.00	0.1~360.00	s	×	The greater power, the longer default acceleration time
P40.03	Deceleration time 0	5.00	0.1~360.00	s	×	
P40.04	Acceleration time 1	5.00	0.1~360.00	s	×	
P40.05	Deceleration time 1	5.00	0.1~360.00	s	×	
P40.06	Acceleration time 2	5.00	0.1~360.00	s	×	
P40.07	Deceleration time 2	5.00	0.1~360.00	s	×	
P40.08	Acceleration time 3	5.00	0.1~360.00	s	×	
P40.09	Deceleration time 3	5.00	0.1~360.00	s	×	
P40.10	Acceleration circular arc Ts0	0.00	0.00~10.00	s	×	Start to accelerate
P40.11	Acceleration circular arc Ts1	0.00	0.00~10.00	s	×	Stop accelerating
P40.12	Deceleration circular arc Ts2	0.00	0.00~10.00	s	×	Start to decelerate
P40.13	Deceleration circular arc Ts3	0.00	0.00~10.00	s	×	Stop decelerating

6.2.5.2 P41 Digital Multi-speed Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P41.00	Digital multi-speed given 0	0.00	0.00~300.00	Hz	×	
P41.01	Digital multi-speed given 1	5.00	0.00~300.00	Hz	×	
P41.02	Digital multi-speed given 2	10.00	0.00~300.00	Hz	×	
P41.03	Digital multi-speed given 3	20.00	0.00~300.00	Hz	×	
P41.04	Digital multi-speed given 4	30.00	0.00~300.00	Hz	×	
P41.05	Digital multi-speed given 5	40.00	0.00~300.00	Hz	×	
P41.06	Digital multi-speed given 6	50.00	0.00~300.00	Hz	×	
P41.07	Digital multi-speed given 7	60.00	0.00~300.00	Hz	×	
P41.08	Digital multi-speed given 8	0.00	0.00~300.00	Hz	×	
P41.09	Digital multi-speed given 9	0.00	0.00~300.00	Hz	×	
P41.10	Digital multi-speed given 10	0.00	0.00~300.00	Hz	×	
P41.11	Digital multi-speed given 11	0.00	0.00~300.00	Hz	×	
P41.12	Digital multi-speed given 12	0.00	0.00~300.00	Hz	×	
P41.13	Digital multi-speed given 13	0.00	0.00~300.00	Hz	×	
P41.14	Digital multi-speed given 14	0.00	0.00~300.00	Hz	×	
P41.15	Digital multi-speed given 15	0.00	0.00~300.00	Hz	×	
P41.16	Inching frequency given	5.00	0.00~50.00	Hz	×	

6.2.6 Group P5X Process Control Parameters

6.2.6.1 Group P50 Process Open Loop Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
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Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P50.00	Open loop auxiliary given mode	0	0~5	/	×	0: no; 1: A0; 2: A1; 3: spare 4: spare 5: PID given target speed
P50.01	Open loop given main and auxiliary relationship calculation	0	0~6	/	×	0: no calculation 1: main+auxiliary 2: main-auxiliary 3: spare 4: spare 5: take the maximum value 6: take the minimum value

6.2.6.2 P51 Process Closed Loop Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P51.00	Closed loop control selection	0	0~1	/	×	0: invalid closed loop run control 1: effective closed loop run control
P51.01	Closed loop control main given mode	0	0~6	/	×	0: internal given 1: A0 2: A1 3: spare 4: spare 5: spare 6: Modbus communication given
P51.02	Closed loop control auxiliary given mode	2	0~6	/	×	0: no 1: A0 2: A1 3: spare 4: spare 5: spare 6: Modbus communication given
P51.03	Closed loop control auxiliary given calculation	0	0~6	/	×	0: no calculation 1: main+auxiliary 2: main-auxiliary 3: spare 4: spare 5: take the maximum value 6: take the minimum value
P51.04	Closed loop control main feedback mode	1	0~6	/	×	0: no 1: A0 2: A1

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
						3: spare 4: spare 5: multi-voltage given 6: Modbus communication given
P51.05	Closed loop control auxiliary feedback mode	2	0~6	/	×	0: no 1: A0 2: A1 3: spare 4: spare 5: spare 6: Modbus communication given
P51.06	Closed loop control feedback main and auxiliary calculation	0	0~6	/	×	0: no calculation 1: main+auxiliary 2: main-auxiliary 3: spare 4: spare 5: take the maximum value 6: take the minimum value
P51.07	PID internal given value	0.70	0.00~10.00		○	The unit depends on P51.08
P51.08	Unit	0	0~3	/	×	Unit 0: V 1: % 2: Mpa 3: degree
P51.09	Proportional gain Kp	0.50	0.00~10.00	/	○	
P51.10	Integral gain Ki	0.50	0.00~10.00	/	○	
P51.11	Differential gain Kd	0.00	0.00~10.00	/	○	
P51.13	Integral mode selection	0	0~1	/	×	0: Stop integral regulation when the frequency reaches the upper and lower limit 1: Continue integral regulation when the frequency reaches the upper and lower limit
P51.22	Integral action upper limit	100.00	0.00~	%	×	
P51.24	Closed loop input upper limit	50.0	0.00~	%	×	
P51.25	closed loop input lower	0.0	0.0~	%	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
	limit		20.0			
P51.26	Closed loop output upper limit	100.0	0.00~	%	×	
P51.28	Dormancy selection	0	0~ 1	/	×	0:N 1:Y
P51.29	Dormancy frequency	10.00	0.00~ 50.00	Hz	×	P51.28=1 valid
P51.30	Dormancy delay	10.0	0~ 655.35	S	×	P51.28=1 valid
P51.31	Awake deviation	0.10	0.0~ 100.0	%	×	P51.2=1 valid,
P51.32	Awake delay	10.0	0.0~ 3600.0	s	×	
P51.33	Given acceleration time	0.0	0.0~ 50.0	s	×	
P51.34	Closed loop output filtering time	0.01	0.00~ 50.000	S	×	
P51.35	Given quantity lower limit	0.00	0.00~ 100.00	V	×	The unit depends on P51.08
P51.36	Feedback quantity range lower limit	0.00	0.00~ 100.00	V	×	The unit depends on P51.08
P51.37	Given quantity upper limit	10.00	0.00~ 100.00	V	×	The unit depends on P51.08
P51.38	Feedback quantity range upper limit	10.00	0.00~ 100.00	V	×	The unit depends on P51.08
P51.39	Preset frequency	22.0	0.0~ Max.Fre quency	Hz	×	
P51.40	Preset frequency holding time	0	0~60	s	×	
P51.41	Positive and negative characteristics	0	0~1	/	×	0: positive characteristic 1: negative characteristic

6.2.6.3 P52 Group specific parameters of Constant pressure water supply

function code	function name	Factory default	Setting range	Unit	Properties	Option description
P52.00	Constant pressure water supply mode	0	0~2	/	×	0: no2; 1: Constant pressure water supply A multi mode; 2: Constant pressure water

						supply A multi With Sleep mode
P52.01	Number of motors	3	1~3	Unit	×	Set the number of motors in the constant pressure water supply system (not including the sleeping pump)
P52.02	Plus Pump frequency	49.50	0~Maximum motor frequency	Hz	×	Set the frequency of constant pressure water supply system plus pump
P52.03	Reduce pump frequency	20.00	0~Maximum motor frequency	Hz	×	Set the frequency of constant pressure water supply system reduce pump
P52.04	Plus Pump Delay	15.0	0~65535	s	×	Set upDelay time of plus pump
P52.05	Reduce pump Delay	15.0	0~65535	s	×	Set upDelay time of reduce pump
P52.06	Auto switching time	60	0~65535	min	×	Set up the Water Supply System Pump regular rotation time
P52.07	Stop turn empty time	60	0~65535	s	×	
P52.08	Prohibit subtraction pump time	3	0~65535	s	×	
P52.09	Switching gap time	0.50	0.00~655.35	s	×	
P52.10	Pressure tolerance	1.0	0.0~100.0	%	×	
P52.11	Sleep pump pressure tolerance	1.0	0.0~100.0	%	×	
P52.12	Plus sleep pump delay	5.0	0.0~6553.5	s	×	Set up Plus sleep pump delay time
P52.13	Reduce sleep pump delay	5.0	0.0~6553.5	s	×	Set up Reduce sleep pump delay time

6.2.7 Group P6X Vector Control Parameters

6.2.7.1 Group P60 Speed Loop Control Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P60.03	Speed loop - low speed P	40.00	0.00~655.35	/	×	Low speed section

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P60.04	Speed loop - low speed I	5.00	0.00~ 655.35	/	×	
P60.05	Speed loop - low speed D	0.00	0.00~ 655.35	/	×	
P60.06	Speed loop - medium speed P	70.00	0.00~ 655.35	/	×	Medium speed section
P60.07	Speed loop - medium speed I	2.00	0.00~ 655.35	/	×	
P60.08	Speed loop - medium speed D	0.00	0.00~ 655.35	/	×	
P60.09	Speed loop - high speed P	70.00	0.00~ 655.35	/	×	High speed section
P60.10	Speed loop - high speed I	2.00	0.00~ 655.35	/	×	
P60.11	Speed loop - high speed D	0.00	0.00~ 655.35	/	×	
P60.12	Switching frequency 0	10.0	0.00~ 655.35	%	×	
P60.13	Switching frequency 1	60.0	0.00~ 655.35	%	×	
P60.14	VFVC Velocity filtering time	15	0~65535	ms	×	

6.2.7.2 Group P61 Current Control Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P61.00	Current loop Kp	1.40	0.01~ 9.99	/	×	
P61.01	Current loop Ki	1.00	0.01~ 9.99	/	×	
P61.02	Current loop Kd	0.00	0.00~ 9.99	/	×	
P61.03	Current loop bandwidth	400.0	0.1~ 1000.0	Hz	×	
P61.04	Magnetic link bandwidth	0.8	0.01~ 1000.0	Hz	×	
P61.05	Current loop selection	0	0~10	/	×	
P61.06	V/F control current loop Max	5.0	0.0 ~100.0	%	×	
P61.07	V/F control current loop Min	5.0	0.0 ~100.0	%	×	

6.2.8 Group P7X Enhanced Control Parameters

6.2.8.1 P70 Limit and Protection Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P70.00	Frequency upper limit	50.00	0.01~ Max.Freq uency	Hz	×	0.01~maximum frequency
P70.01	Frequency lower limit	0.00	0.01~ Freq. upper limit	Hz	×	0.01~frequency upper limit
P70.02	Maximum output frequency	55.00	0.01~ 300.00	Hz	×	0.01~300.00
P70.03	Spare	0	×	×	×	
P70.04	Output torque limit	150	0~200	%	×	
P70.05	Inverter acceleration overcurrent threshold value	160	0~200	%	×	
P70.06	Inverter deceleration overvoltage threshold value	750	0~800	V	×	
P70.07	Overspeed protection coefficient	120.00	0.00~	%	×	
P70.08	Special function selection	16	0~ 65535	/	×	
P70.10	PT signal channel	0	0~2	/	×	0: NC 1:A0 2:A1
P70.11	PT protection upper threshold value	10.000	0.000~ 10.000	V	×	
P70.12	PT protection lower threshold value	0.000	0.000~ 10.000	V	×	
P70.13	PT protection action delay	3.0	0.0~ 10.0	s	×	
P70.14	HT signal channel	0	0~2	/	×	0: NC 1:A0 2:A1
P70.15	HT protection upper threshold value	10.000	0.000~ 10.000	V	×	
P70.16	HT protection lower threshold value	0.000	0.000~ 10.000	V	×	
P70.17	HT protection action delay	3.0	0.0~ 10.0	s	×	
P70.18	Bus undervoltage	380	0~540	V	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
	threshold value					
P70.19	No-load up maximum torque	0	0~400	%	×	
P70.20	No-load down maximum torque	0	0~400	%	×	
P70.21	PWM detection delay	800	0~65535	ms	×	
P70.22	Low MinFreq	0	0~3		×	0: run at the lower limit frequency 1: stop 2: given frequency 0 3: inertia stop
P70.23	Limit current limit frequency current given	120	0~65535	%	×	
P70.24	current limit Kp	0.0001	0.0~0.015	/	×	
P70.25	current limit Ki	0.0001	0.0~0.2000	/	×	
P70.26	current limit OutMin	2.0	0.0~6553.5	%	×	
P70.27	current limit Recovery value	10	0~100	%	×	
P70.28	Limit current limit frequency voltage given	10	0~65535	%	×	

6.2.8.2 P71 Control Optimization Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P71.00	Frequency hopping speed 1	0.00	0.00~100.00	Hz	×	
P71.01	Frequency hopping speed 2	0.00	0.00~100.00	Hz	×	
P71.02	Frequency hopping speed 3	0.00	0.00~100.00	Hz	×	
P71.03	Frequency hopping width	0.00	0.00~100.00	Hz	×	
P71.04	Inertia compensation factor	0.00	0.00~100.00	%	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P71.05	No reverse	0	0~1	/	×	0: N 1: Y
P71.06	Interval time for forward and reverse	0.0	0.0~6553.5	s	×	
P71.07	PWM modulation mode	2	0~2	/	×	0: 5-section; 1: 7-section; 2: <30%rpm 7-section, >30% 5-section
P71.08	Automatic torque lifting	119	0~1000	/	×	0: none 1: automatic torque lifting 2: suppression oscillation 4: slip compensation 8: stator resistance compensation 16: dead-time compensation 32: bus voltage compensation 64: suppression oscillation 2 (bit selection function)
P71.09	V/F torque compensation	0.0	0.0~30.0	%	×	Manual torque lifting, P71.08=0
P71.10	V/F compensating maximum frequency	10.0	0.0~50.0	Hz	×	
P71.11	Dead-time compensation mode	0	0~2	/	×	0: compensate 100% as per angle; 1: compensate 50% as per angle; 2: compensation as per current
P71.12	Current slow down time	0.00	0.01~655.35	s	×	
P71.14	Carrier frequency	6.000	1.100~8.000	KHz	×	
P71.15	Random PWM width	0.000	0.000~1.000	KHz	×	
P71.16	Regulator mode	1	0~3	/	×	
P71.17	Contacting turning-on delay	0.8	0.0~10.0	s	×	
P71.18	Open delay	0.4	0.0~10.0	s	×	
P71.19	Contacting shutoff delay	1.0	0.0~10.0	s	×	
P71.20	Brake delay	0.1	0.0~	s	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
			10.0			
P71.21	Output shutoff delay	0.3	0.0~ 10.0	s	×	
P71.22	Zero speed threshold value	0.20	0.00~ 10.00	Hz	×	
P71.23	Forward dead-time compensation	100	0~100	%	×	
P71.24	Reverse dead-time compensation	100	0~100	%	×	
P71.25	Zero servo compensation	0	0~100	%	×	
P71.28	Zero servo current loop gain factor	100	50~200	%	×	
P71.29	PWM modulation selection	0	0~1	/	×	0: underflow updating 1: overflow/underflow updating Set as 1 for the switching frequency below 4kHz
P71.33	Speed precision adjustment	100.0	0.0~ 100.0	%	×	
P71.34	Performance improving compensation	106	0~1000	/	×	
P71.35	System inertia factor	0.0	0.0~ 300.0	%	×	
P71.36	Automatic low speed torque lifting	0.0	0.0~ 300.0	%	×	
P71.39	Power failure detection threshold value	480	380~ 550	V	×	
P71.40	KEB bus target voltage	500	380~ 550	V	×	
P71.41	Power failure handling mode	0	0~4	/	×	0: no handling 1: track start (time limit) 2: track start (time unlimited) 3: KEB (with detection undervoltage) 4: KEB (no detection undervoltage)
P71.42	Maximum outage compensation time	3.0	0.0~ 60.0	s	×	
P71.43	KEB shortest action	100	0~2000	ms	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
	time					
P71.44	KEB initial frequency reduction quantity	2.00	0.00~5.00	~	×	
P71.45	KEB deceleration time	10.00	0.00~200.00	s	0.00 ~ 300.00	
P71.46	KEB deceleration mode	0	0~3	/	×	0: variable deceleration 1: automatic deceleration 2: constant deceleration 3: constant deceleration (antistall)
P71.47	KEB acceleration time	25.00	0.00~300.00	s	×	
P71.48	KEB proportional Kp	200.00	0.00~300.00	/	×	
P71.49	KEB integral Ki	0.00	0.00~300.00	/	×	
P71.50	KEB differential Kd	0.00	0.00~300.00	/	×	
P71.51	KEB integral upper limit	100.0	0.0~300.00	%	×	
P71.52	KEB integral lower limit	100.0	0.0~300.00	%	×	
P71.53	KEB closed loop output upper limit	100.0	0.0~300.00	%	×	
P71.54	KEB closed loop output lower limit	100.0	0.0~300.00	%	×	
P71.55	KEB voltage deviation upper limit	300.00	0.0~500.0	V	×	
P71.56	KEB voltage zero deviation value	0.0	0.0~10.0	V	×	
P71.57	Variable carrier frequency threshold value	0.00	0.00~50.00	Hz	×	
P71.58	Fan control selection	0	0~4	/	×	
P71.59	Optimization parameter 1	0.0000		/	×	
P71.62	UP/DOWN single step length	0.10	0.00~10.00	Hz	×	

6.2.9 Group P8X Communication Parameters

6.2.9.1 Group P80 Communication Selection Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P80.00	Communication mode selection	0	0~3	\	×	0: No communication 1: Profibus_DP; 2: Modbus; 3:Canbus

6.2.9.2 Group P81 Modbus Communication Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P81.00	Communication baud rate	3	0~7	bps	×	0: 1200 bps
						1: 2400 bps
						2: 4800 bps
						3: 9600 bps
						4: 19200 bps
P81.01	Data format	0	0~2	/	×	5: 38400 bps
						6: 57600 bps
						7: 76800 bps
						0: 1-8-1, None
P81.02	Transmission mode selection	1	0~1	/	×	1: 1-8-1, ODD
						2: 1-8-1, EVEN
						0: ASC;1: RTU
P81.04	Local address	1	1~247	/	×	1~247, 0 is broadcast address
P81.05	Communication status word set 1	0		/	×	
P81.06	Communication status word set 2	0		/	×	
P81.07	Communication address format selection	1		/	×	0: hexadecimal number system; 1: decimal number system
P81.08	Modbus specific function	0	0~1	/	×	0: no 1: output voltage0dot

6.2.9.3 Group P82 Profibus_DP Communication Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P82.00	Local address	0	0~255	/	×	0~255

P82.01	Big endian and little endian mode	0	0~1	/	×	See communication appendix B
P82.02	User-defined status word set 1	16			×	See communication appendix B
P82.03	User-defined status word set 2	13		/	×	See communication appendix B
P82.04	User-defined status word set 3	10		/	×	See communication appendix B
P82.05	User-defined status word set 4	18		/	×	See communication appendix B

6.2.10 Group P9X Fault and Display Parameters

6.2.10.1 Group P90 Language Selection Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P90.00	Manipulator language selection	0	0~1	/	×	0: Chinese 1: English

6.2.10.2 Group P91 LCD Display Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P91.00	U01 display data	20	0~34	/	×	Refer to Chapter 7
P91.01	U02 display data	2	0~34	/	×	
P91.02	U03 display data	3	0~34	/	×	
P91.03	U04 display data	4	0~34	/	×	
P91.04	U05 display data	7	0~34	/	×	
P91.05	U06 display data	5	0~34	/	×	Refer to Chapter 7
P91.06	U07 display data	29	0~34	/	×	
P91.07	U08 display data	34	0~34	/	×	
P91.08	U01 - U08 monitoring selection	0	0~65535	/	×	

6.2.10.3 Group P92 LED Display Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P92.00	LED display data	2	0~34	/	×	Refer to Chapter 7

6.2.10.4 Group P93 Running Record Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P93.00	Inverter accumulated electrification time	0	0~65535	h	*	
P93.01	Inverter accumulated running time	0	0~65535	h	*	
P93.02	Radiator maximum temperature record	0.0	0.0~100.0	degree	*	
P93.03	Accumulated output power	0.0	0.0~999.9	kWh	*	
P93.04	Inverter output power	0	0~65535	MWh	*	
P93.05	Fan running time	0	0~65535	h	*	

6.2.10.5 Group P94 Troubleshooting Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P94.00	Inverter minor fault	1	0~3	/	*	0: no fault relay output for

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
	processing mode					minor fault 1: fault relay output for minor fault 2: fault relay output and shutdown for 52#PTC fault, and no automatic reset for the fault 3: 1 and 2 are valid.
P94.01	Inverter fault automatic reset time	10.0	0.0~180.0	s	*	Inverter fault automatic reset time
P94.02	Inverter fault automatic reset times	0	0~100	/	*	Inverter fault automatic reset times
P94.03	Radiator overheating time	0.5	0.0~180.0	s	×	
P94.04	Overspeed protection time	1.0	0.0~180.0	s	×	
P94.05	Input default phase voltage threshold	65	0~150	V	×	
P94.06	Braking resistor short times	10	0~100	per	×	
P94.07	Encoder disconnection times confirmed	2	0~100	per	×	
P94.08	Output default phase confirm time	2.000	0.000~180.000	s	×	
P94.09	Relay fault confirm voltage	90	0~350	V	×	
P94.10	CD misphase judgement threshold	300	300~1000	/	×	
P94.11	ABZ protection threshold	20	20~100	%	×	
P94.12	IGBT protection times	2	0~1000	/	×	
P94.13	I _{2t} protection selection	0	0~3	/	×	
P94.14	Analog A0 disconnection value	0.0	0.0~100	%	×	
P94.15	Analog A1 disconnection value	0.0	0.0~100	%	×	
P94.16	Abnormal analog treatment	0	0~5	/	×	0: no treatment 1: protection shutdown

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
						2: run at the current speed 3: run at the maximum amplitude limit 4: run at the minimum amplitude limit 5: run at the set value for multi-speed 15
P94.17	Temperature sampling disconnection treatment	0	0~1	/	×	0: no treatment 1: protection shutdown
P94.18	Communication Protection	2	0~2	/	×	0: no treatment 1: Shutdown: No Power protection 2: Shutdown: There are power protection
P94.19	Communication disconnection protection time	2.000	0.000~65.535	s	×	
P94.20	Grounding protection times	100	1~60000	/	×	

6.2.10.6 Group P95 Product Identification Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P95.00	Inverter hardware version	450.04		/	*	Inverter hardware version
P95.01	Inverter software version	Factory		/	*	Inverter software version
P95.02	Version number	100. 01		/	*	Version number
P95.03	Profibus_DP Software version	0.000			*	Profibus_DP software version

6.2.10.6 Group P96 Inverter Product Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P96.00	Inverter rated power	Automatic identification	0.0~999.9	kW	×	
P96.01	Inverter rated current		0.0~999.9	A	×	
P96.02	Inverter maximum current		0.0~999.9	A	×	

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Chapter 7 Parameter Details

7.1 Introduction to the Main Menu

7.1.1 Parameter Setting

Parameters in groups P0X-P9X will be displayed after it enters. When the login password is correct, the modifiable parameters can be modified. Refer to the following for their specific meanings.

Simple table field	Description
Function code symbol	Function code symbol, for example P00.00
Name of function code	Name of function code, to explain its roles
Function code option	List of function code parameter setting
Setting range	The minimum and maximum value set permitted by function code
Unit	V: voltage; A: current; °C: degree; Ω: ohm; mH: millihenry rpm: rotating speed %: percentage; bps: baud rate; Hz, kHz: frequency; ms, s, min, h, kh: time; kW: power; /: no unit, etc
Factory default	Function code set value after reset to factory default operation (see P00.04)
Properties	○: modifiable during running; ×: modifiable only during stop; *: read-only parameter, unchangeable
User setting	Parameter record by the user

7.1.2 Motor Tuning

This option is motor self-learning. For the different motor firstly connecting to inverter, it is better to have a self-learning.

If the motor nameplate and other parameters are known, please directly write them into the related parameters; if the motor internal parameters are unknown, please execute parameter self-tuning. Press ENTER to determine and select the self-learning scheme.

- 0: normal running mode
- 1: encoder static self-learning (reserved)
- 2: encoder correction
- 3: encoder self-learning ends
- 4: motor static self-learning
- 5: motor dynamic self-learning
- 6: motor static advanced learning
- 7: encoder dynamic self-learning (reserved)

8: Reset fault

NOTE: Press the ESC key to return to the main menu interface

7.1.3 Fault Check

Press ENT to enter list of fault, 8 faults will be displayed in reverse time order. If some fault is found, press ENT to display the bus voltage, output current and running frequency etc when it occurs.

52 fault codes totally, whose corresponding fault type is shown in the following table.

Fault No.	Fault display	Fault No.	Fault display
1	Module overcurrent protection	2	ADC fault
3	Radiator overheating	4	Braking unit fault
5	Fuse blown fault	6	Output over-torque
7	Speed variation	8	Bus overvoltage protection
9	Bus undervoltage	10	Output default phase
11	Motor low speed overcurrent	12	Spare
13	Current detected during parking	14	Reverse speed during running
17	Forward overspeed	18	Reverse overspeed
21	abc overcurrent	22	Brake detection fault
23	Input overvoltage	27	Output overcurrent
29	Input default phase	30	Overspeed protection
31	Motor high speed overcurrent	32	Grounding protection
33	Capacitor aging	34	External fault
35	Output unbalance	36	Parameter setting error
37	Current sensor fault	38	Braking resistor short circuit
39	Too large instantaneous current value	40	Output contactor fault
43	Communication fault	44	Abnormal input power
45	I ² t instantaneous value overcurrent	46	I ² t effective value overcurrent
47	Abnormal analog input	48	High temperature sampling disconnection
49	PT detection fault	50	Humidity fault
51	Abnormal running output current	52	PTC over-temperature warning
53	Master control board error	56	Motor fan abnormal

7.1.4 Parameter Processing

Press ENTER to enter. The function is used for change permission and initialization level of setting parameters.

0: Modification for all parameters.

1: No modification for all parameters.

2: Reset the parameters in group POX to the factory defaults.

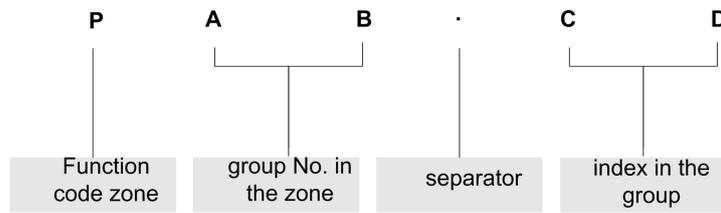
3: Reset the parameters other than in group P0X (user-defined function code visible and invisible area) to the factory defaults.

4: Reset all user parameters to the factory defaults.

Note: after parameter initialization, password set by the user resets automatically. Press ESC to return to the main menu interface.

7.2 Classification and Format of Parameter Groups

7.2.1 Format of Parameter Groups



7.2.2 Zoning of Parameter Groups

Function code zone	Group No. in the zone	Description of function code
P0X user parameters	Group P00	Password parameter group
P1X control parameters	Group P10	Basic control parameter group
	Group P11	Start parameter group
	Group P12	Parking parameter group
	Group P13	Braking function parameter
	Group P14	V/F parameter group
P2X motor parameters	Group P20	Basic motor parameter group
	Group P21	Advanced motor parameter group
	Group P23	Motor protection parameter group
P3X terminal control parameters	Group P30	Digital input parameter group
	Group P31	Digital output parameter group
	Group P32	Analog input parameter group
	Group P33	Analog output parameter group
P4X speed parameters	Group P40	Basic speed parameter group
	Group P41	Digital multi-speed parameter group
P5X process control parameters	Group P50	Process open loop parameter group
	Group P51	Process closed loop parameter group
P6X vector control parameters	Group P60	Speed loop control parameter group
	Group P61	Current loop control parameter group
P7X enhanced control parameters	Group P70	Limit and protection parameter group
	Group P71	Control optimization parameter group
P8X communication parameters	Group P80	Communication control selection group
	Group P81	Modbus communication group

	Group P82	Profibus DP communication group
P9X display parameters	Group P90	Language selection group
	Group P91	LCD display group
	Group P92	LED display group
	Group P93	Running record parameter group
	Group P94	Troubleshooting parameter group
	Group P95	Inverter product identification parameter group
	Group P96	Inverter product parameter

7.3 Group P0X User Parameter Groups

7.3.1 Group P00 Basic Function Parameters

Function code	Function name	Setting range	Factory default
P00.00	Login password	0~65535	0

This function is to prevent the irrelevant personnel from inquiring or modifying parameters, so as to protect safety of the inverter parameters.

00000: No password protection. All parameters may be inquired, no password provided for the inverter at factory.

Once the user password set becomes valid, when it enters parameter setting status again, all parameters can't be modified via operation panel unless the correct password is input, which can be viewed only. Parameter password is always shown as 00000.

Note: factory setting of AS180 series inverter isn't provided with user password (P00.00=0), therefore no password is provided for your first login.

Function code	Function name	Setting range	Factory default
P00.01	Modify password	0~65535	0

Set a password:

Input a 5-digit number as user password, then press ENTER to confirm it, and reset it once.

Change password:

Press ENTER to enter password authentication status, 00000 is displayed. Then enter parameter editing status after the correct password is input, select P00.01 (P00.00 parameter is displayed as 00000), input the new password and press ENTER to confirm it. Then reset the same password as P00.01 once again, indicating successfully setting the new password if "successful password setting" is shown.

Cancel password:

Press ENTER to enter password authentication status, 00000 is displayed, and then input the correct user password to enter parameter editing status. View P00.01 to be 00000, press ENTER to confirm, reset P00.01=00000, then the password is cancelled after “password clear” is shown.

Function code	Function name	Setting range	Factory default
P00.02	Reserved password	0~65535	0

When the setting password is forgotten, users can input the spare password to modify parameter value, including new password.

7.3.2 Group P01~09 ←User Function Parameter

7.4 Group P1X Control Parameter Groups

7.4.1 Group P10 Basic Control Parameters

Function code	Function name	Setting range	Factory default
P10.00	Control mode selection	0~5	0

The function is to set the control running mode of inverter. Of which, 0 is V/f control, 1, 3 and 5 mean vector speed control; 2 is vector torque control; 4 is spare.

0: Voltage vector V/f control: it applies to most applications, regulating frequency proportional to voltage, keep control speed under flux, without encoder.

Please reasonably set V/F control parameters in group P14 when selecting V/F control, to reach the good control effect.

1: Vector control 2 without speed sensor: it applies to the general variable speed drive applications with high speed control precision and greater torque requirement.

When selecting vector control, motor parameter self-tuning will be executed firstly, to correctly set the motor nameplate parameter as P20.xx~P20.xx and obtain the accurate motor parameters by starting motor parameter self-tuning. At the same time, vector control parameters in group P6X will be set reasonably, to realize its best control effect.

2: Vector control with speed sensor: it is similar to 3, it is provided with speed encoder, with higher control precision and better speed protection.

3: Vector control with speed sensor: Pulse encoder is required, which is able to realize speed with higher precision than vector control 2 without encoder speed feedback and torque performance

4: Spare.

5: Vector control 1 without speed sensor: Pulse encoder isn't required, which is able to realize speed with higher precision than open loop VF and torque performance. Performance index is less than vector control 2 without speed sensor, but not sensitive to motor parameters. It applies to the applications where motor parameters can't easily be obtained.

Function code	Function name	Setting range	Factory default
P10.01	Rotation mode selection	0~3	0

P10.01 is used to set a mode to control inverter start and stop by use of terminals X0 (forward) and X1 (reverse) under terminal running command given mode.

0: 2-wire 1;

K2	K1	Running command
0	0	Stop
1	0	Reverse
0	1	Forward
1	1	Stop

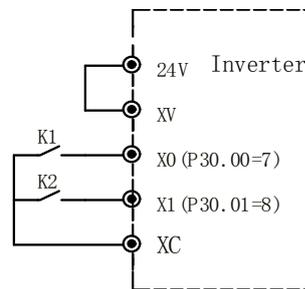


Figure 7-1 2-wire running mode 1

1: 2-wire 2;

K2	K1	Running command
0	0	Stop
1	0	Stop
0	1	Forward
1	1	Reverse

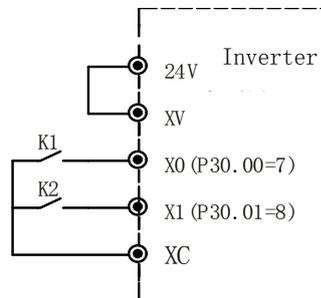


Figure 7-2 2-wire running mode 2

2: 3-wire 1;

Terminal Xi (i=2 ~ 7) sets the function “9: 3-wire running control”.

When K3 closes, K0 (forward) and K1 (reverse) control are effective; when K3 opens, K0 and K1 control are invalid, and the inverter stops.

Rising edge of terminal X0 indicates forward running command; while that of terminal X1 is reverse running command.

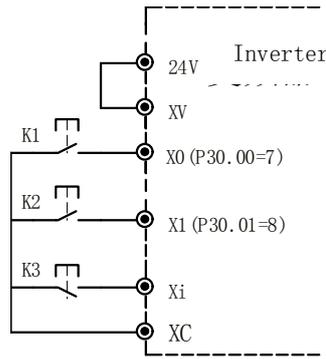


Figure 7-3 3-wire running mode 1

3: 3-wire 2;

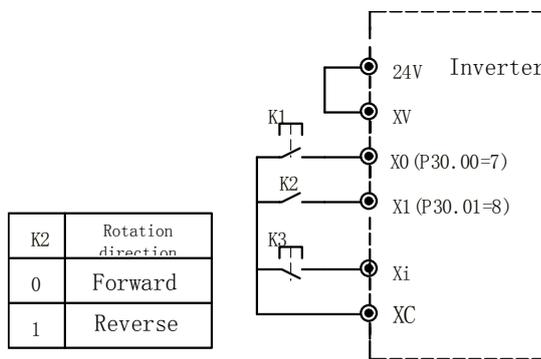


Figure 7-4 3-wire running mode 2

Terminal Xi (i=2 ~ 7) sets the function “9: 3-wire running control”.

Rising edge of terminal K1 indicates running command; when K2 opens, indicating the forward direction command; when K3 closes, indicating the reverse direction command. When K3 opens, the inverter stops.

4: 1 wire operating mode

1 wire operating mode From an input terminal to control the starting and stopping of the inverter by the analog input (A0 or A1) determine the direction of polarity, analog input size determines the size of the operating frequency.

Function code	Function name	Setting range	Factory default
P10.02	Running command given mode	0~4	0

There are 3 different inverter running command given modes for selection.

0: Operation panel running command given mode: execute the operations such as run, stop and forward/reverse rotation with the buttons RUN (F1), STOP (F2) and LO/RE (F3) on the operation panel.

1: Terminal running command given mode: execute the operations such as run, stop and forward/reverse rotation by defining the multifunctional terminals X0 ~ X7. Refer to P30.00 ~ P30.07.

2: Communication given mode: execute the operations such as run, stop and forward/reverse rotation by means of Modbus communication. Refer to the Appendix Modbus Communication Protocol.

3: CAN given: optional, give command by means of CANBus.

4: Profibus_DP given: optional, give command by means of Profibus_DP.

See the related supplementary agreement for communication protocol of 3, 4.

Function code	Function name	Setting range	Factory default
P10.03	Frequency/speed given mode 1	0~16	0

The function applies to frequency given under V/f control, vector control without sensor and vector control with sensor. See the function code in group P10.00 for control mode.

0: Panel digital frequency given, set frequency given with P40.00

Increase or decrease the frequency with ▲ and ▼ during running, at this time, stop will be held, but not power failure.

1: Digital multi-speed given target speed

Digital multi-speed terminals 0-3 are effective, then frequency is determined by this terminal combination, see P41.00 ~ P41.15.

2: Spare.

3: A0 analog target speed given

4: A0 analog current speed given

5: A1 analog target speed given

6: A1 analog current speed given

Give target speed via analog input port, at this time, output frequency is calculated according to acceleration and deceleration time in group P40. Also give current speed, then acceleration and deceleration time in group P40 are invalid.

7: Communication given current speed

Standard configuration, see Modbus protocol.

8: Function given target speed

Macro situation in industrial applications.

9: Spare.

10: Spare.

11: Spare.

12: Communication given target speed

Standard configuration, see Modbus protocol.

13: CAN given current speed

14: CAN given target speed

Optional, give speed command by means of CANBus.

15: Up/Down given speed

16: Profibus_DP given speed

Optional, give speed command by means of Profibus_DP

Function code	Function name	Setting range	Factory default
P10.06	Speed limit selection	0~4	0

Select the different channel to limit speed given and avoid over-speed. It is effective only under torque control mode.

0: Internal parameter limit: Limit by means of the upper and lower limit frequency of P70.00 and P70.01.

1: Analog 0 limit

2: Analog 1 limit: 10V corresponding to the maximum output frequency of P70.02.

3: Spare.

4: ModBus communication limit: See Modbus protocol.

5: Automatic limit

Function code	Function name	Setting range	Factory default
P10.07	Frequency/speed given mode 2	0~16	0

Same as P10.03 frequency/speed given mode 1.

7.4.2 Group P11 Start Control Parameter

Function code	Function name	Setting range	Factory default
P11.00	Start mode	0~2	0

Different start modes can be adopted according to different applications.

0: Run from the starting frequency P11.01, then accelerate to the set frequency after starting frequency holding time P11.02.

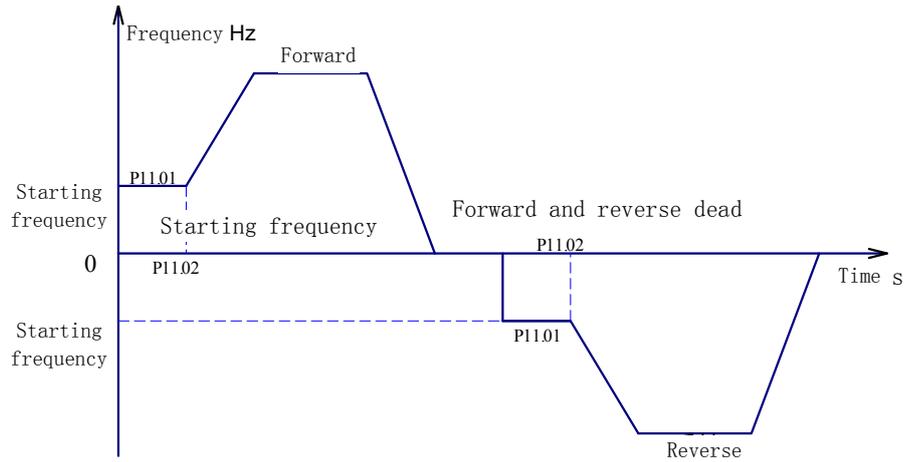


Figure 7-5 Schematic of start mode for starting frequency

1: Firstly inject DC, to have DC excitation and braking for the motor. Injection quantity and time is set by P11.03 and P11.04. After injection time is reached, run from the starting frequency P00.01, then accelerate to the set frequency after starting frequency holding time P11.02.

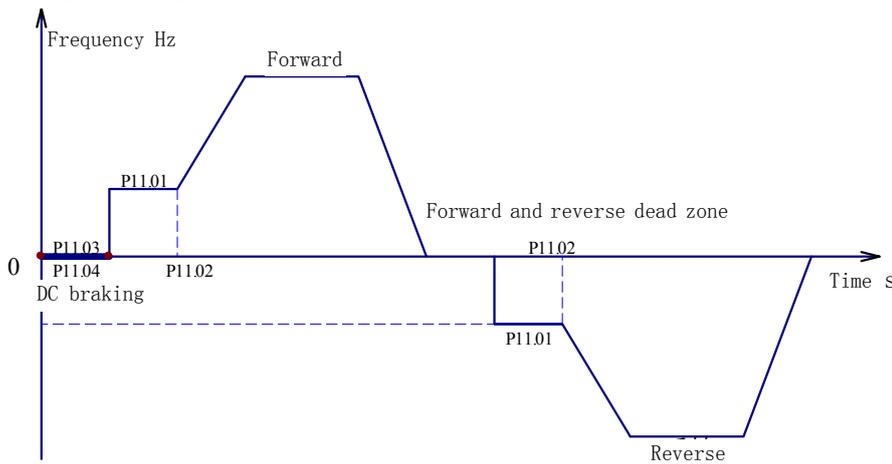


Figure 7-6 Schematic of start mode for DC braking

2: Speed tracking start

The inverter is able to identify the rotating speed of the motor, and execute direct tracking start from the identified frequency. During starting, current and voltage shall be smooth, free from shock.

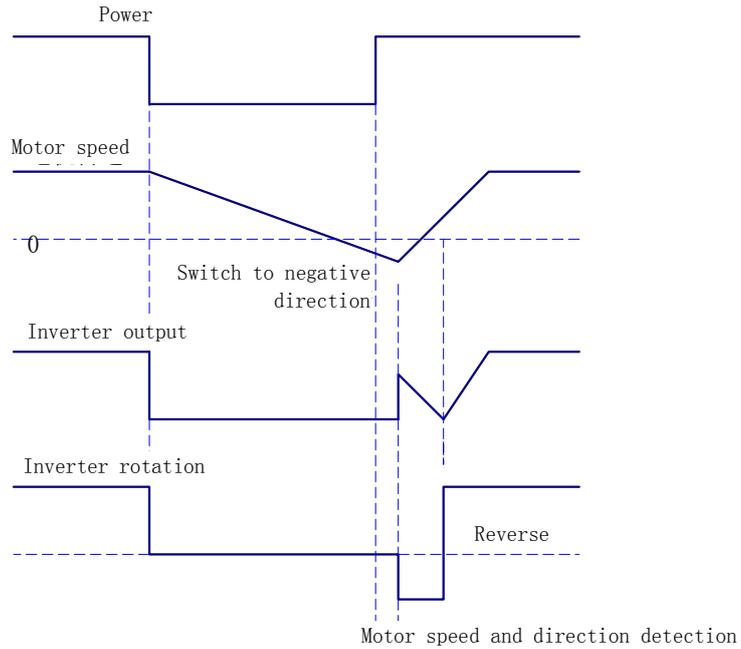


Figure 7-7 Schematic of speed tracking start mode

Function code	Function name	Setting range	Factory default
P11.01	Start holding frequency (Hz)	0.00~30.00	0.00
P11.02	Starting frequency holding time(s)	0.00~3600.00	0.00

Starting frequency is the initial frequency when the inverter starts, shown as f_s in the figure. Starting frequency holding time is the time to keep running under starting frequency of the inverter during its starting, shown as the figure. The inverter won't work when frequency command is below the starting holding frequency.

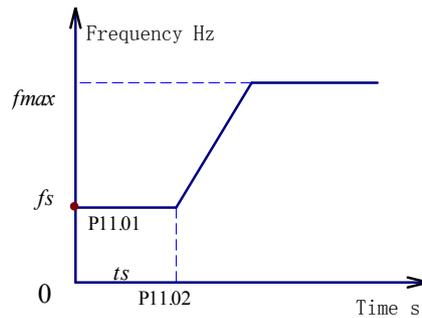


Figure 7-8 Schematic of starting frequency and starting time

The inverter begins to run from starting frequency P11.01, then accelerate at the set acceleration time after starting frequency holding time P11.02.

Note: for the applications with heavy load starting, it is advantageous to properly set starting frequency holding time. Under encoder speed feedback vector control, factory default of the starting frequency is 0.00Hz, while others are set as 0.05Hz.

Function code	Function name	Setting range	Factory default
---------------	---------------	---------------	-----------------

P11.03	Start DC injection current (%)	0.00~120.00	30.00
P11.04	Start DC injection time (s)	0.0~99.9	5.0

P11.03 and P11.04 are valid only when “DC braking first, then starting mode (P11.00=1)” is chosen in start running mode, shown as the following figure:

Setting of start DC braking current (P11.03) is percentage to the inverter rated current, if the DC braking current set is greater than 120% rated motor current, then the current injected will be 120% motor rated current. Heavy load: 0.0 ~ 120.0%; light load: 0.0 ~ 90.0%.

Note: it applies to motor open control in lifting industry. Motor open conditions are met only when the current to start forward rotation of the motor is greater than P11.03 current value.

Start DC braking time (P11.04) is the action time injected. When P11.04=0, no DC braking process is provided.

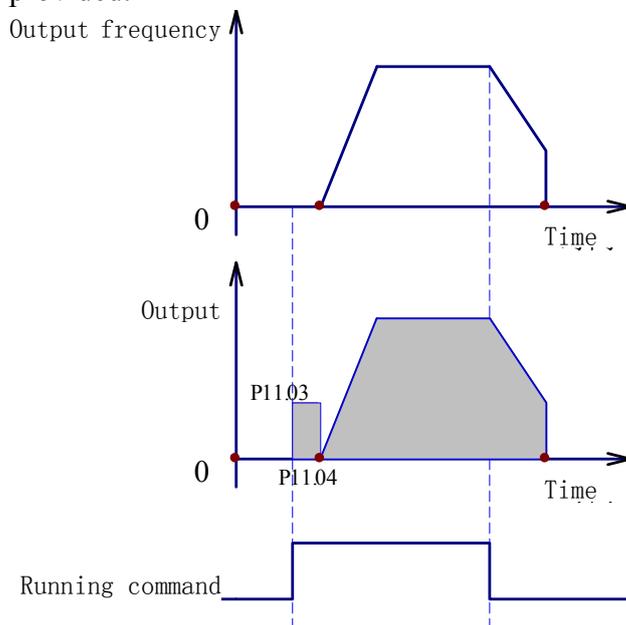


Figure 7-9 DC braking schematic

Function code	Function name	Setting range	Factory default
P11.05	Excitation time (s)	0.0~99.9	0.3

Excitation time means the time to set up the flux in advance before the motor is started, with the purpose of reaching quick response when the motor starts. When there is running command, firstly enter the pre-excitation status according to the time set by this function code. After magnetic flux is set up, enter the normal accelerated operation. If the function code is set as 0, indicating no exciting process required. Excitation time default parameter is set as 0 under VF control, modifiable. Other control defaults are 0.3, modifiable.

Note: the motor may rotate during pre-exciting, at this time, please apply mechanical braking.

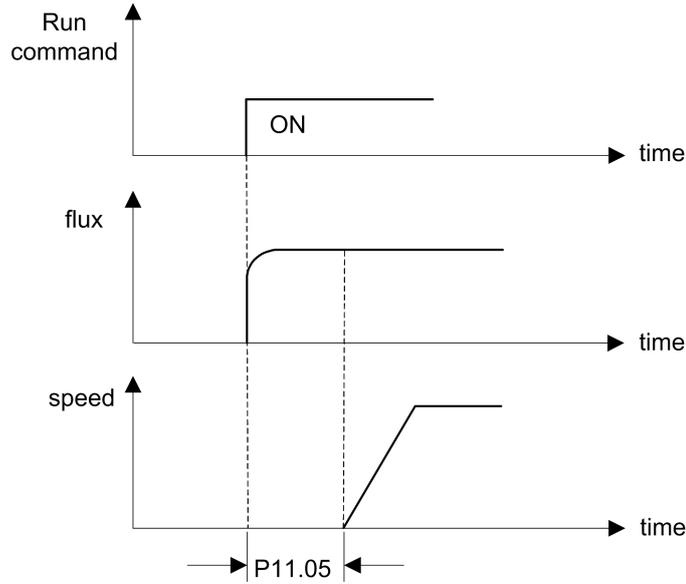


Figure 7-10 Pre-excitation schematic

Function code	Function name	Setting range	Factory default
P11.07	Brake actuation time (s)	0.0~99.99	0.20

Brake actuation time is the time from the outer brake receiving open command to being fully opened. The brake enters zero servo time, namely zero speed holding time.

Function code	Function name	Setting range	Factory default
P11.08	Tracking delay time (ms)	0~65535	1000

The time is used to wait the motor to demagnetize. If overcurrent appears at beginning of tracking, then it will be increased.

Function code	Function name	Setting range	Factory default
P11.09	Track zero voltage time (ms)	0~65535	100

Enter tracking waiting time.

Function code	Function name	Setting range	Factory default
P11.10	Tracking voltage Kp	0~65535	0.20

Kp during tracking. If it is too small, tracking process will be longer, otherwise overcurrent may be caused during tracking.

Function code	Function name	Setting range	Factory default
P11.11	Tracking voltage Ki	0~6553.5	0.30

Ki during tracking. If it is too small, tracking process will be longer, otherwise overcurrent may be caused during tracking.

Function code	Function name	Setting range	Factory default
P11.12	Tracking voltage Kd	0~6553.5	0.00

Kd during tracking. If it is too small, overshoot current won't be controlled obviously during tracking, otherwise, if it is too large, overcurrent may be caused during tracking.

Function code	Function name	Setting range	Factory default
P11.13	Tracking exit delay (ms)	1000~65535	1000

Ensure to exit from tracking process steadily. Its increase is helpful to exit steadily.

Function code	Function name	Setting range	Factory default
P11.14	Maximum current during tracking (%)	0.0~200.0	100.0

Percentage of the motor rated current. When small inverter is used to drive large motor, ensure the maximum current during tracking is less than the inverter rated current. If overcurrent appears during tracking, it should be reduced.

Function code	Function name	Setting range	Factory default
P11.15	Tracking frequency change gain (%)	0.0~100.0	10.0

If overvoltage or P60.09 greater than 600V appears during tracking, this value shall be decreased.

Function code	Function name	Setting range	Factory default
P11.16	Maximum voltage during tracking (V)	0~65535	0

This parameter is only for reading, to monitor the maximum bus voltage during tracking.

Function code	Function name	Setting range	Factory default
P11.17	Initial tracking frequency (Hz)	0.00~100.00	50.00

It is set as the maximum running frequency before tracking. If inertia parking speed of the system drops speedily, this value may be decreased properly.

Function code	Function name	Setting range	Factory default
P11.18	Maximum current during tracking (A)	0.0~6553.5	0.0

This parameter is only for reading, to monitor the maximum effective current value during tracking.

Function code	Function name	Setting range	Factory default
P11.19	Reverse opening current (%)	0.00~1000.00	20.00

It applies to the motor open control in lifting industry. Open conditions will be met only when the current to start reverse is greater than P11.19.

7.4.3 Group P12 Parking Control Parameters

Function code	Function name	Setting range	Factory default
P12.00	Parking mode	0~4	0

Different parking modes will be adopted according to different applications.

0: inverter output lockout, free parking for the motor

1: slow down and stop as the set deceleration time

2: slow down and stop as the set DC braking. When the frequency is less than DC braking starting frequency P12.03, inject DC braking current P12.04. DC braking time is determined by P12.05.

3: slow down and stop as the set deceleration time. Excitation is kept on the motor after stop, to fast respond to starting when running command is received.

4: Slow down and stop as the set deceleration time. Maintain the current torque at zero speed, then stop after P12.6 lasted.

Function code	Function name	Setting range	Factory default
P12.01	Parking holding frequency (Hz)	0.00~300.00	0.00
P12.02	Parking frequency holding time (s)	0.1~99.9	0.0

The inverter decelerates to parking frequency P12.01 from its normal running speed, then slow down to zero as the set deceleration time after parking frequency holding time P12.02, which is advantageous to stop smoothly.

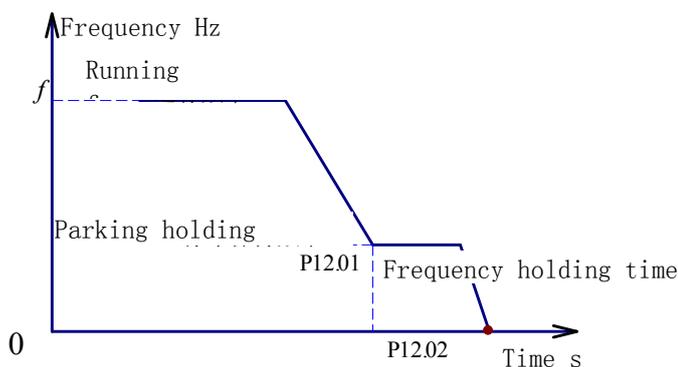


Figure 7-11 Parking holding frequency schematic

Function code	Function name	Setting range	Factory default
P12.03	DC braking starting frequency (Hz)	0.00~10.00	2.50
P12.04	Parking DC braking current (%)	0.00~100.00	50.0
P12.05	Parking DC braking time (s)	0.0~10.0	0.5

P12.03~P12.05 are valid only when stop mode selects “deceleration + DC braking (P12.00=2)”.

Setting of parking DC braking current (P12.03) is percentage to the inverter rated current, if DC braking current set exceeds 120% motor rated current, then the injected current will be 120% motor rated current. Heavy load: 0.0 ~ 120.0%; light load: 0.0 ~ 90.0%.

Start current braking time (P12.04) is the injected actuation time. When P12.04=0, no DC braking process is provided.

When P12.00=2, P12.03 can be set as braking starting frequency, to apply fast braking.

P12.03 sets DC braking current, which is percentage to the inverter rated current. Variable torque load: 0.0 ~ 90.0%.

P12.04 sets the actuation time for DC braking.

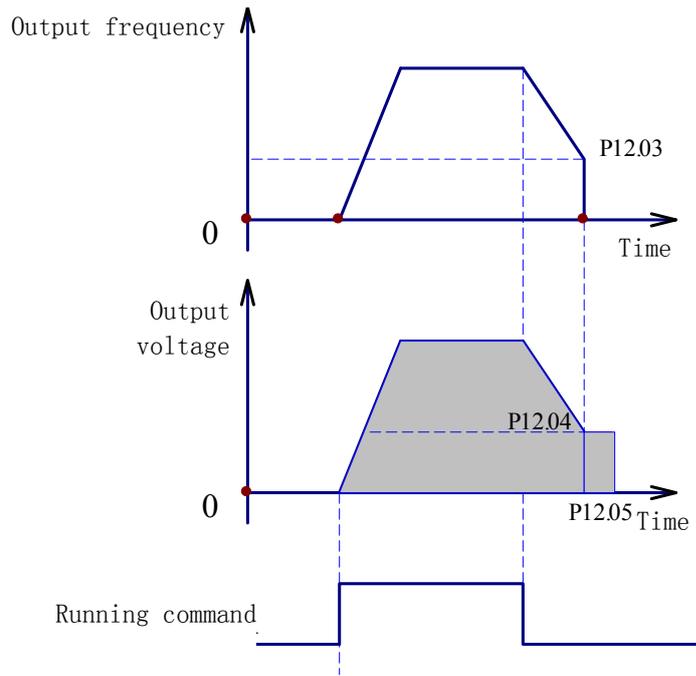


Figure 7-12 Parking DC braking schematic

Function code	Function name	Setting range	Factory default
P12.06	Stop excitation holding time (s)	0~65535	0

Parking mode adopts “deceleration + excitation/torque holding”, the inverter stops after excitation/torque holding time is greater than P12.06.

7.4.4 Group P13 Braking Function V/F Control Parameters

Function code	Function name	Setting range	Factory default
P13.00	Dynamic braking selection	0~1	1
P13.01	Braking turning-on voltage	620~750	660
P13.02	Braking unit service time	0.0~300.0	60.0

P13.00 dynamic braking selection reflects whether the inverter applies dynamic braking.

0: Open dynamic braking function.

1: Dynamic braking function not used.

For the applications with big rotational inertia and fast braking & stop, braking unit and braking resistor matched to them may be selected, also braking parameters will be set to realize fast braking and stop.

P13.02 braking unit service time, P13.01 braking turning-on voltage are valid to the inverter provided with built-in braking unit only.

Braking unit actuation service time can be set, generally 100s.

Regulate P13.01 to select the action voltage of braking unit, to realize fast dynamic braking and stop.

Note: set P13.00 as 1 if built-in braking unit is applied, refer to 1.9 “Braking resistor selection” for its components type.

7.4.5 Group P14 V/F control Parameters

Function code	Function name	Setting range	Factory default
P14.00	V/F curve given	0~4	0
P14.01	V/F voltage value V0 (V)	0.0~460.0	76.0
P14.02	V/F frequency value F0 (Hz)	0.00~300.00	10.00
P14.03	V/F voltage value V1 (V)	0.0~460.0	152.0
P14.04	V/F frequency value F1 (Hz)	0.00~300.00	20.00
P14.05	V/F voltage value V2 (V)	0.0~460.0	228.0
P14.06	V/F frequency value F2 (Hz)	0.00~300.00	30.00
P14.07	V/F voltage value V3 (V)	0.0~460.0	304.0
P14.08	V/F frequency value F3 (Hz)	0.00~300.00	40.00
P14.09	V/F voltage value V4(V)	0.0~460.0	380.0
P14.10	V/F frequency value F4 (Hz)	0.00~300.00	50.00

Parameter P14.00 is used to determine the different V/F curves under voltage vector V/F control running mode (P10.00=0).

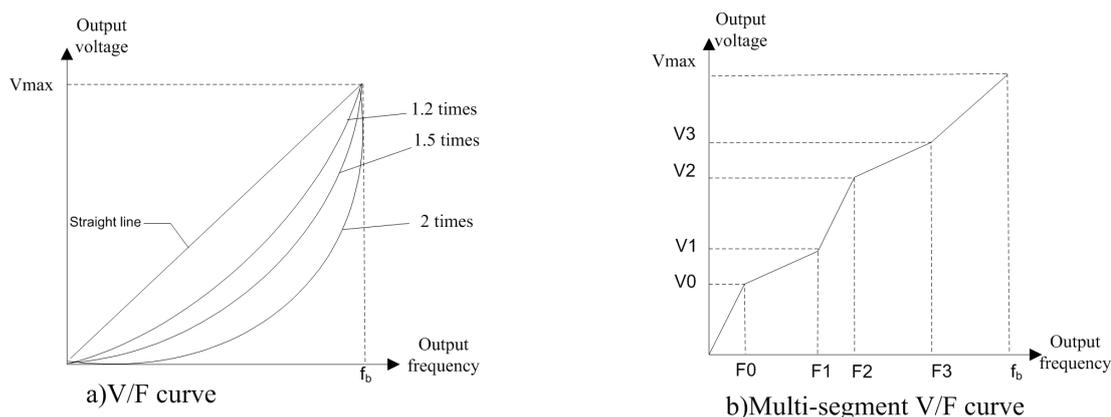


Figure 7-13 VF curve schematic

P14.00=0 applies to the constant torque load, sharing a linear relationship of factor 1 between V and F. Refer to the straight line in figure for details.

P14.00=4 user-defined curve, which applies to the sectional constant torque load, shown as the figure.

In Figure 7-12: $F_0 < F_1 < F_2 < F_3 < F_4 \leq f_b$, f_b is the basic running frequency P40.01.

$V_0 \leq V_1 \leq V_2 \leq V_3 < V_4 \leq V_{max}$, V_0 , V_1 , V_2 , V_3 and V_4 are the actual output voltage relative to the maximum output voltage and rated frequency ($V_1 = (V_{max}/f_b) * F_1$ default $V_{max}=380V$, $f_b=50Hz$).

P14.00=1~3 applies to the variable torque load in fan and water pump. P14.00 is set as 1 ~ 3, corresponding to 1.2-power curve, 1.5-power curve and second power curve respectively, shown as Figure 7-12. Of which, second power curve applies to water supply, while the rest applies to other medium liquid load. Choose the proper curve according to the actual conditions.

7.5 Group P2X Motor Parameter Groups

7.5.1 Group P20 Basic Motor Parameters

Function code	Function name	Setting range	Factory default
P20.00	Motor 1 type	0~1	0
P20.01	Motor 1 rated power (kW)	0.4~400.0	
P20.02	Motor 1 rated current (A)	0.1~999.9	
P20.03	Motor 1 rated frequency (Hz)	0~300	50
P20.04	Motor 1 rated speed (rpm)	0~30000	1460
P20.05	Motor 1 rated voltage (V)	0~460	380
P20.06	Motor 1 poles	2~128	4
P20.07	Motor 1 rated slip frequency (Hz)	0.10~655.35	1.40

P20.00 motor type: 0: asynchronous motor

P20.01 ~ P20.07 and P20.11 are used to set motor parameters driven by the inverter. Correctly set the parameters according to the motor nameplate prior to use.

P20.06 is used to set motor poles based on the nameplate. If no motor poles parameter is provided on the nameplate, you can calculate it according to the following formula:

$$\text{Poles} = (120 \times f) \div n.$$

Where: n is rated speed and f is rated frequency.

For the calculated value, the even integer will be the poles.

Note: the inverter power grade shall be matched with the motor.

P20.07 is used to set the slip frequency.

If no slip frequency data is provided on the motor nameplate, you can calculate P20.07 with the following formula:

Set rated frequency as f (P20.03), rated speed as n (P20.04) and motor poles as p (P20.06),

$$\text{then: slip frequency} = f - ((n \times p) \div 120).$$

For example: rated frequency 50Hz, rated speed 1430rpm and motor poles 4,

$$\text{Then } P20.07 = 50 - ((1430 \times 4) \div 120) = 2.33\text{Hz}.$$

Function code	Function name	Setting range	Factory default
P20.08	Motor 1 maximum slip frequency (Hz)	0.1~655.35	2.80
P20.09	Motor 1 phase sequence	0~1	1
P20.10	Motor 1 no-load current coefficient (%)	0~60.0	30.00

P20.08 sets the motor maximum slip frequency, which is 2 times of rated slip frequency typically.

P20.09 sets the motor rotation direction, 0 is negative phase sequence rotation, while 1 is positive phase sequence rotation.

P20.10 sets the motor no-load current coefficient, about 30% typically.

Function code	Function name	Setting range	Factory default
P20.13	Motor 1 maximum frequency (Hz)	0~300	50

P20.01 ~ P20.07 and P20.11 are used to set motor parameters driven by the inverter. Correctly set the parameters according to the motor nameplate prior to use.

Function code	Function name	Setting range	Factory default
P20.14	Motor 2 type	0~1	0
P20.15	Motor 2 rated power (kW)	0.4~400.0	
P20.16	Motor 2 rated current (A)	0.1~999.9	
P20.17	Motor 2 rated frequency (Hz)	0~300	50
P20.18	Motor 2 rated speed (rpm)	0~30000	1460
P20.19	Motor 2 rated voltage (V)	0~460	380
P20.20	Motor 2 poles	2~128	4
P20.21	Motor 2 rated slip frequency (Hz)	0.10~655.35	1.40
P20.22	Motor 2 maximum slip frequency (Hz)	0.10~655.35	2.80
P20.23	Motor 2 phase sequence	0~1	1
P20.24	Motor 2 no-load current coefficient (%)	1.00~60.00	30.00
P20.26	Motor 2 maximum frequency (Hz)	0~300	50

P20.14 ~ P20.26 set motor 2, according to the parameters specification of motor 1.

7.5.2 Group P21 Advanced Motor Parameters

Function code	Function name	Setting range	Factory default
P21.00	Motor turning	0~6	0

P21.00 motor tuning

- 0: normal running
- 1: encoder static self-learning (reserved)
- 2: encoder self-learning correction
- 3: encoder self-learning ends
- 4: motor static self-learning
- 5: motor dynamic self-learning
- 6: motor static advanced self-learning
- 7: encoder dynamic self-learning (reserved)

Function code	Function name	Setting range	Factory default
P21.01	Motor 1 stator resistance (Ω)	0.000~65.000	0.072
P21.02	Motor 1 rotor resistance (Ω)	0.000~65.000	0.054
P21.03	Motor 1 stator inductance (H)	0.0000~6.0000	0.0221
P21.04	Motor 1 rotor inductance (H)	0.0000~6.0000	0.0221
P21.05	Mutual inductance 1 (H)	0.0000~6.0000	0.0210

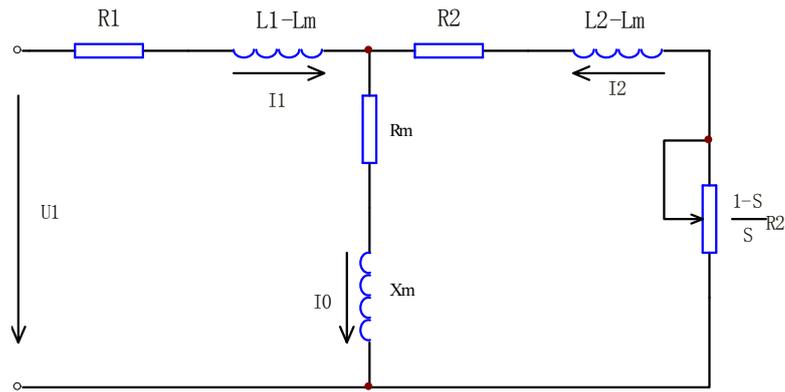


Figure 7-14 Circuit diagram of asynchronous motor steady state equivalent

R_1 , R_2 , L_1 , L_2 , L_m and I_0 in the figure respectively stand for: stator resistance, stator inductance, rotor resistance, rotor inductance, mutual inductance and excitation current. Excitation current may be calculated by the rated current and power factor of the motor, also may be measured by rotation self-tuning.

Relationship between rated torque current, excitation current and the motor rated current:

$$\text{Rated torque current} = \text{power factor} \times \text{motor rated current}$$

$$\text{No-load excitation current} = \sqrt{(1 - \text{power factor}^2)} \times \text{motor rated current} \times \text{motor efficiency}$$

generally the motor efficiency is 85%.

As the internal characteristic parameters, P21.01, P21.02, P21.03, P21.04 and P21.05 are only valid to the asynchronous motor, and will be automatically obtained by the self-learning operation of the inverter to the motor.

The key motor parameters affecting the inverter running control could be determined through parameter self-tuning, which will be saved in the inverter automatically after parameter self-tuning is completed, until the next parameter input or parameter self-tuning again.

Parameter self-tuning process is shown as:

Correctly input P20.00 ~ P20.11 according to the motor nameplate; correctly set the basic running frequency P40.01, maximum output frequency P70.02 and maximum output voltage P70.03; set the proper acceleration and deceleration time P40.02 and P40.03.

Select the mode to execute parameter self-tuning (see start menu selection):

Function code	Function name	Setting range	Factory default
P21.06	Motor 2 stator resistance (Ω)	0.000~65.000	0.072
P21.07	Motor 2 rotor resistance (Ω)	0.000~65.000	0.054
P21.08	Motor 2 stator inductance (H)	0.0000~6.0000	0.0221
P21.09	Motor 2 rotor inductance (H)	0.0000~6.0000	0.0221
P21.10	Mutual inductance 2 (H)	0.0000~6.0000	0.0210

Tuning of motor 2 parameters is the same as motor 1.

7.5.4 Group P23 Motor Protection Parameters

Function code	Function name	Setting range	Factory default
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P23.00	Motor overheat protection selection	0~2	0
P23.01	Motor sensor protection threshold value (V)	0.00~10.00	5.00
P23.02	Motor overcurrent protection time (s)	0.5~300.0	60.0

P23.00 motor overheat protection selection:

0: no protection

1: input via analog A0

2: input via analog A1

P23.01 is the set protection threshold value and P23.02 is the set overcurrent protection time.

Function code	Function name	Setting range	Factory default
P23.03	Motor low speed overcurrent threshold value (%)	0.00~150.00	150.00
P23.04	Motor low speed overcurrent time (s)	0.1~120.0	60.0
P23.05	Motor high speed overcurrent threshold value (%)	0.00~150.00	120.00
P23.06	Motor high speed overcurrent time (s)	0.1~60.0	30.0

P23.03 ~ P23.06 set the motor speed and overcurrent threshold value, with overspeed set within 20%. Overcurrent rate and time are inversely proportional function, the higher the overcurrent peak, the shorter the set time. These parameters can be set after the motor report. Separate the high speed and low speed as 20%.

7.6 Group P3X Terminal Parameter Groups

7.6.1 Group P30 Digital Input Parameters

Function code	Function name	Setting range	Factory default
P30.00	Terminal X0 input function selection	0~63	7
P30.01	Terminal X1 input function selection	0~63	8
P30.02	Terminal X2 input function selection	0~63	0
P30.03	Terminal X3 input function selection	0~63	0
P30.04	Terminal X4 input function selection	0~63	8
P30.05	Terminal X5 input function selection	0~63	0
P30.06	Terminal X6 input function selection	0~63	0

Definition list of function input terminals:

No.	Function definition	No.	Function definition
0	No-function	1	Acceleration and deceleration time selection 0
2	Acceleration and deceleration time selection 1	3	Digital speed 0
4	Digital speed 1	5	Digital speed 2
6	Digital speed 3	7	Forward (FWD)
8	Reverse (REV)	9	3-wire running control
10	Spare	11	Spare

12	Spare	13	External reset terminal
14	External fault terminal	15	External self-learning input terminal
16	Emergency power supply running	17	Weighing compensation input
18	Base lockout	19	Light load switch input
20	Heavy load switch input	21	Output contactor detection
22	Brake contactor detection	23	Brake switch detection
24	Motor selection	25	Encoder selection
26	Function parameter 0 (spare)	27	Function parameter 1 (spare)
28	Pulse frequency DI0 input (spare)	29	Pulse frequency DI1 input (spare)
30	Speed/torque switching	31	Frequency increase (no hold)
32	Frequency decrease (no hold)	33	Emergency stop signal
34	FWD deceleration input	35	REV deceleration input
36	FWD stop input	37	REV stop input
38	Frequency increase (no hold)	39	Frequency decrease (no hold)
40	Inching frequency selection	41	Command switching to operation panel
42	Command switching to terminal	43	Command switching to upper computer
44	Open loop main and auxiliary given switching	45	PID main given switching to internal
46	PID main given switching to analog A0	47	auxiliary given switching to invalid
48	PID auxiliary given switching to analog A0	49	FJOG command
50	RJOG command	51	PID main given switching to analog A1
52	PID auxiliary given switching to analog A1	53	Speed given mode selection
54	PID Pause	55	1 pump locking
56	2 pump locking	57	3 pump locking
Others	Spare		

Meaning of the function code:

- 0: no-function
- 1: acceleration and deceleration time terminal 0
- 2: acceleration and deceleration time terminal 1

Refer to the following table for the usage.

Acceleration and deceleration time selection 0	Acceleration and deceleration time selection 1	Acceleration and deceleration time selection
OFF	OFF	Acceleration and deceleration time 0 (P40.02, P40.03)
OFF	ON	Acceleration and deceleration time 1 (P40.04, P40.05)
ON	OFF	Acceleration and deceleration time 2 (P40.06, P40.07)
ON	ON	Acceleration and deceleration time 3 (P40.08, P40.09)

- 3: digital speed 0
 - 4: digital speed 1
 - 5: digital speed 2
 - 6: digital speed 3
- See P41.00 ~ P41.15 for the usage.

7: terminal forward input (FWD)

8: terminal reverse input (REV)

9: 3-wire running control

They are valid only in terminal running command given mode (P10.02=1). See P10.01 for the usage.

10: spare

11: spare

12: spare

See P51.14 ~ P51.21 for the usage.

13: external reset terminal

Valid external reset terminal signal, the external signal could reset the fault of the inverter

14: external fault terminal

Valid external fault terminal signal, the inverter stops running.

15: external self-learning input terminal, magnetic pole tuning input

External input signal controls self-learning start

16: emergency power supply running

Indicate the inverter under the external emergency conditions

17: weighing compensation input

Weighting compensation command input set by the user in specific applications

18: base lockout

Effectively prohibit the inverter output

19: light load switch input

20: heavy load switch input

These two functions are used in elevator industry. Comparing the actual load weight with the balance weight, if the former is less than the latter, indicating light load; otherwise heavy load.

21: output contactor feedback

It is used with output function 17 typically, to control the inverter output contactor, so as to confirm closing status of the contactor before current is output from the inverter, and timely cut off the inverter output meanwhile the contactor is tripping.

22: brake contactor feedback

It is used with output function 18 typically, to judge whether output contactor of the brake closes.

23: brake limit feedback

It is used with output function 18 typically, to judge whether the brake opens.

24: motor selection

Refer to the following table for its usage:

Motor selection	Motor parameter group selection
OFF	Motor 1 parameter group
ON	Motor 2 parameter group

25: encoder selection

Encoder selection	Encoder parameter group selection
-------------------	-----------------------------------

OFF	Encoder 1 parameter group
ON	Encoder 2 parameter group

26: function parameter 0: spare

27: function parameter 1: spare

28: pulse input 0: spare

29: pulse input 1: spare

30: speed/torque mode switching

Valid input signal, the inverter control mode is switched to torque mode from speed mode.

31: frequency increase (no hold)

When the signal is valid, target frequency continues to increase, until reaching the amplitude limit; otherwise the current frequency will be kept. Stop and outage frequency is 0.

32: frequency decrease (no hold)

When the signal is valid, target frequency continues to decrease, until 0; while the signal is invalid, keep the current frequency. Stop and outage frequency is 0.

33: emergency stop (snag signal)

Valid under closed loop vector control, speed regulator given 0, which makes the inverter fast stop in the maximum reverse torque.

34: forward deceleration

Valid under the forward running conditions, target frequency 0Hz, the inverter decelerates to 0Hz.

35: reverse deceleration

Valid under the reverse running conditions, target frequency 0Hz, the inverter decelerates to 0Hz.

36: forward stop

Valid under the forward running conditions, the inverter stops.

37: reverse stop

Valid under the reverse running conditions, the inverter stops.

38: frequency increase (hold)

When the signal is valid, target frequency continues to increase, until the amplitude limit; when the signal is invalid, keep the current frequency, the same to stop and outage.

39: frequency decrease (hold)

When the signal is valid, target frequency continues to decrease, until 0; when the signal is invalid, keep the current frequency, the same to stop and outage.

40: inching frequency selection

This signal is valid under multi-speed running conditions, target frequency is inching frequency.

41: command switching to operation panel

Valid in stop status, command channel switching to panel given.

42: command switching to terminal

Valid in stop status, command channel switching to panel given.

- 43: command switching to Modbus communication
Valid in stop status, command channel switching to Modbus given.
- 44: open loop main and auxiliary given switching
Valid signal, speed channel source switches to open loop auxiliary given, namely P10.03 speed channel selection switches to P50.00 given mode.
- 45: valid signal if PID main given switches to internal, process closed loop control main given channel switches to digital internal given, otherwise no switching.
- 46: valid signal if PID main given switches to analog A0, process closed loop control main given channel switches to A0, otherwise no switching.
- 47: valid signal if PID auxiliary given switches to invalid, process closed loop control auxiliary given channel switches to invalid, otherwise no switching.
- 48: valid signal if PID auxiliary given switches to analog A0, process closed loop control auxiliary given channel switches to A0, otherwise no switching.
- 49: FJOG command. Valid signal for inching forward command, forward running takes inching frequency as target frequency. The inverter will stop if the signal is invalid.
- 50: FJOG command. Valid signal for inching reverse command, reverse running takes inching frequency as target frequency. The inverter will stop if the signal is invalid. Inching running shares the highest priority.
- 51: Valid signal when PID main given switches to analog A1, process closed loop control main given channel switches to A1, otherwise no switching.
- 52: Valid signal when PID auxiliary given switches to analog A1, process closed loop control auxiliary given channel switches to A1, otherwise no switching.
- 53: speed given mode selection
Refer to the following table for its usage:

Speed given mode selection	Speed given mode
OFF	P10.03 speed given mode 1
ON	P10.07 speed given mode 2

- 54: PID pause
This signal is valid, the process closed loop PID operation pause

55~58: NO.1~NO.3 motor lock

When this signal is valid, the corresponding pump exits the loop switch logic.

Function code	Function name	Setting range	Factory default
P30.07	P1-P2 terminal input function selection	0~63	0

PTC over temperature protection input terminal: default high level, which is reduced with over temperature signal

Function code	Function name	Setting range	Factory default
P30.08	Filtering times of terminals X0~X7 (times)	0~100	5

Improve the anti-interfance ability of terminals by properly increasing P30.08. The longer their filering times, the longer the delay times of their actions.

7.6.2 Group P31 Digital Output Parameters

Function code	Function name	Setting range	Factory default
P31.00	Output K1 function definition	0~63	2
P31.01	Output K2 function definition	0~63	25
P31.02	Output K3 function definition	0~63	0
P31.03	Output K4 function definition	0~63	0
P31.04	Output K5 function definition	0~63	0
P31.05	Output K6 function definition	0~63	0

Y0 ~ Y1 terminal output can be defined as multifunctional digital output, also as high speed pulse output (function 19 and 20), K1 ~ K4 relay output also may be defined as multifunctional output, but not as pulse input.

Function definition list of multifunctional digital output:

Function set	Meaning	Function set	Meaning
0	No-function	1	RDY
2	Inverter fault	3	Running signal (RUN)
4	Frequency arrive signal (FAR)	5	Consistent frequency and speed (FDT)
6	Inverter running at zero speed	7	DC bus voltage not less than 80% rated voltage
8	More than 5% rated current during running, while 10% when it stops	9	In self-tuning
10	Speed detection 1	11	Speed detection 2
12	Output 1 for fault forecast, normal output 0	13	Spare
14	Zero servo torque direction output	15	Zero current detected
16	Generating and motoring status identification	17	Output contactor closing
18	Brake release	19	Pulse output DO0
20	Pulse output DO1	21	Radiator overheat alarm
22	Motor overheating alarm	23	Motor selection output
24	Encoder selection output	25	Brake output
26	Accumulated running time arrive	27	Single running time arrive
28	Output X1	29	Output X2
30	Stop undervoltage lockout	31	Fan control
32	Analog input disconnection	33	PTC alarm
34	In reverse	35	sleeping
Reserved for Constant pressure water supply			
36	No.1 pump frequency conversion	37	No.1 pump power frequency

Function set	Meaning	Function set	Meaning
38	No.2 pump frequency conversion	39	No.2 pump power frequency
40	No.3 pump frequency conversion	41	No.3 pump power frequency
42	No.4 pump frequency conversion (spare)	43	No.4 pump power frequency (spare)
44	No.5 pump frequency conversion (spare)	45	No.5 pump power frequency (spare)
46	No.6 pump frequency conversion (spare)	47	No.6 pump power frequency (spare)
48	No.7 pump frequency conversion (spare)	49	No.7 pump power frequency (spare)
50	Sleeping pump operation	51	Frequency detection 3
52	Frequency detection 4	53	Frequency detection 5

Note 1: setting of P31.00 ~ P31.05 defines the functions of such 6 output ports as K1 ~ K2 and Y0 ~ Y3, whose range of value set and functions of the corresponding output port set for each value are shown as the following:

0: no-function

1 or 101: ready (RDY)

1: Normal self-check and no trouble, the related output point connected, otherwise disconnected;

101: Normal self-check and no trouble, the related output point disconnected, otherwise connected;

2 or 102: inverter fault

2: The inverter is in fault shutdown status, the related output point connected, otherwise disconnected;

102: The inverter is in fault shutdown status, the related output point disconnected, otherwise connected;

3 or 103: inverter running signal (RUN)

3: When the inverter is able to run normally responding to running command, the related output point connected, otherwise disconnected;

103: When the inverter is able to run normally responding to running command, the related output point disconnected, otherwise connected;

6 or 106: In zero speed running

6: When output frequency is 0 during running, the related output point connected, otherwise disconnected;

106: When output frequency is 0 during running, the related output point disconnected, otherwise connected;

7 or 107: DC bus voltage not less than 85% rated value

7: When the inverter bus voltage isn't less than 85% rated value, the related output point connected, otherwise disconnected;

107: When the inverter bus voltage isn't less than 85% rated value, the related output point disconnected, otherwise connected;

8 or 108: more than 5% rated current during running, while 10% rated current during stop

8: if the above conditions are met, the related output point connected, otherwise disconnected;

108: if the above conditions are met, the related output point disconnected, otherwise connected;
 9 or 109: in self-tuning
 9: when the inverter is in self-tuning status, the related output point connected, otherwise disconnected;
 109: when the inverter is in self-tuning status, the related output point disconnected, otherwise connected;

10 or 110: frequency detection 1

When the inverter output frequency reaches or exceeds any frequency detection (P31.22) plus frequency detection width (P31.23), frequency detection 1 is triggered; after the related output point takes action and the inverter frequency drops to any frequency detection (P31.22) again, frequency detection 1 resets.

10: when frequency detection 1 takes action, the related output point disconnected;

110: when frequency detection 1 takes action, the related output point connected;

11 or 111: frequency detection 2

When the inverter output frequency reaches or exceeds any frequency detection (P31.22), frequency detection 2 is triggered; after the inverter frequency drops to any frequency detection (P31.22) again minus frequency detection width (31.23), frequency detection 2 resets.

11: when frequency detection 2 takes action, the related output point connected;

111: when frequency detection 2 takes action, the related output point disconnected;

12 or 112: fault forecast

12: during fault forecast, the related output point connected, otherwise disconnected;

112: during fault forecast, the related output point disconnected, otherwise connected;

13 or 113: inverter alarm

13: when the inverter is in alarm status but not fault shutdown, the related output point connected, otherwise disconnected;

113: when the inverter is in alarm status but not fault shutdown, the related output point disconnected, otherwise connected;

14 or 114: zero servo torque direction judge (for the outage emergency leveling of the motor)

14: When the inverter measures heavy load and light counterweight, the related output point connected, otherwise disconnected;

114: When the inverter measures heavy load and light counterweight, the related output point disconnected, otherwise connected;

15 or 115: zero current detection

15: when output current exceeds zero current detection threshold (P31.20) during stop, the related output point connected, otherwise disconnected;

115: when output current exceeds zero current detection threshold (P31.20) during stop, the related output point disconnected, otherwise connected;

16: generating and motoring status identification 0: motoring; 1: generating

116: generating and motoring status identification 0: generating; 1: motoring

- 17: output contactor closing the contactor closes for output 1
It is used with function 21, to control the contactor to close before the inverter outputs any current
- 117: output contactor closing the contactor closes for output 0
- 18: brake release open the brake for output 1
It is used with functions 22 and 23, to control the external brake to open at the right time, and confirm the feedback point
- 118: brake release open the brake for output 0
- 19: pulse DO0 output (spare)
- 119: pulse DO0 output opposite to 19 level direction (spare)
- 20: pulse DO1 output (spare)
- 120: pulse DO1 output opposite to 20 level direction (spare)
- 21 or 121: greater than 90°C, overheat alarm
If the radiator temperature $\geq 80^{\circ}\text{C}$, the related output point connected, otherwise disconnected.
- 22: motor overheat alarm output
- 23: motor switching output
Motor selection output, the related output point disconnected: motor 1, the related output point connected: motor 2
- 24: encoder switching output
Encoder selection output, the related output point disconnected: encoder 1;
Related output point connected: encoder 2
- 25: hoisting brake output
Brake opens, output point connected; brake closes, output point disconnected.
- 26: accumulated running time arrive
Accumulated running time of the inverter exceeds the time set in P31.25, output terminal connected, other disconnected;
- 27: set continuous running time arrive
Single continuous running time of the inverter exceeds the time set in P31.24, output terminal connected, other disconnected;
- 28: output X1
Output the level status of input terminal X1 via output terminal
- 29: output X2
Output the level status of input terminal X2 via output terminal
- 30: Under-voltage block stop, system under-voltage, effective level output of the output terminal
- 31: Fan control, the inverter is in running or overheating, the output terminal connected, otherwise disconnected after a minute delay
- 32: Analog input disconnection
- 33: PTC alarm
0~10V input type of analog A0 and A1 channel connects to motor PTC signal, P32.01 and P32.07 are set as 6, P32.04 and P32.10 filtering time is set as 2000ms, protection threshold P23.01, if motor PTC signal is greater than P23.01 and lasted for 2s, 52# fault will be sent.

34: in reverse

Special terminal function of constant pressure water supply

36~49: Set the corresponding water pump frequency conversion, power frequency control signal

50: Sleep pump operation

The pump is running When satisfied dormant, the corresponding output terminals connected, dormant pump starts running, otherwise disconnected.

51~53: Frequency detection 3~5 function

When the frequency of the frequency converter is higher than the corresponding frequency detection limit value, the corresponding output terminal is switched on, and when the lower limit value of the frequency is lower, the output terminal is disconnected.

Note: “connected” above mentioned means: for the relay output, the normally open contacts (1B and 1C, 2B and 2C) connected, while the normally closed contacts (1B and 1A, 2B and 2A) disconnected; for the collector open circuit output, it means the output point is in low level status. Similarly, “not connected” above mentioned means: for the relay output, the normally open contacts (1B and 1C, 2B and 2C) disconnected, while the normally closed contacts (1B and 1A, 2B and 2A) connected; for the collector open circuit output, it means the output point is in high resistance status.

Note 2: P31.04=3 for default set, appointing port Y0 as running signal (RUN) output port; P31.05=2, appointing port Y1 as the inverter fault signal output port.

Note 3: running (RUN) signal given

When the inverter receives up/down direction command signal and no base lockout is provided, running signal (RUN) only can be given.

Note 4: time sequence of fault signal

Output the fault signal when the inverter has any fault. At the same time, running signal is cleared. Fault signal is latched, which will be eliminated via the external input reset signal, reset operation of the manipulator, or outage, or delay time internally set.

Time sequence of fault signal is shown as Figure 7-15.



Figure 7-15 Time sequence of fault signal

Function code	Function name	Setting range	Factory default
P31.06	Output K1 action delay (s)	0.0~60.0	0.0
P31.07	Output K1 reset delay (s)	0.0~60.0	0.0
P31.08	Output K2 action delay (s)	0.0~60.0	0.0
P31.09	Output K2 reset delay (s)	0.0~60.0	0.0
P31.10	Output K3 action delay (s)	0.0~60.0	0.0
P31.11	Output K3 reset delay (s)	0.0~60.0	0.0
P31.12	Output K4 action delay (s)	0.0~60.0	0.0
P31.13	Output K4 reset delay (s)	0.0~60.0	0.0

P31.14	Output Y0 action delay (s)	0.0~60.0	0.0
P31.15	Output Y0 reset delay (s)	0.0~60.0	0.0
P31.16	Output Y1 action delay (s)	0.0~60.0	0.0
P31.17	Output Y1 reset delay (s)	0.0~60.0	0.0

Setting of signal output delay and reset delay at output end

P31.06 ~ P31.17 are time constant to set action delay and reset delay for such 6 signals as K1 ~ K4 and Y0 ~ Y1 at output end. By these parameters, delay time of the actual signal corresponding to output status at each output end can be set as required. And delay time will be set respectively for delay of the above output status whether in signal triggering or signal reset.

Function code	Function name	Setting range	Factory default
P31.20	Zero current detection threshold (%)	0.0~50.0	4.0

Zero current detection threshold of the inverter

This function is used for load change detection, set output terminal function as “15: zero current detected”, and output the indicator signal after the inverter output current is below zero current detection width P31.20.

When the inverter current exceeds the threshold during stop, the related output end set by function code 15 (or 115) takes action.

Note: the function parameter is percentage of the inverter output current to the motor rated current.

Function code	Function name	Setting range	Factory default
P31.21	Frequency consistence detection width (Hz)	0.00~300.00	1.00
P31.22	Any frequency detection speed (Hz)	0.00~300.00	1.00
P31.23	Any frequency detection width (Hz)	0.00~300.00	0.20

P31.21 This function is used for deviation detection between output frequency and set frequency, set output terminal function as “4: frequency arrive signal”, when the deviation between the inverter output frequency and set frequency is in the set range of the function code, outputs the indicator signal, shown as the figure, frequency arrive signal FAR.

Yi represents terminals Y0-Y1 or relay terminals K1-K4.

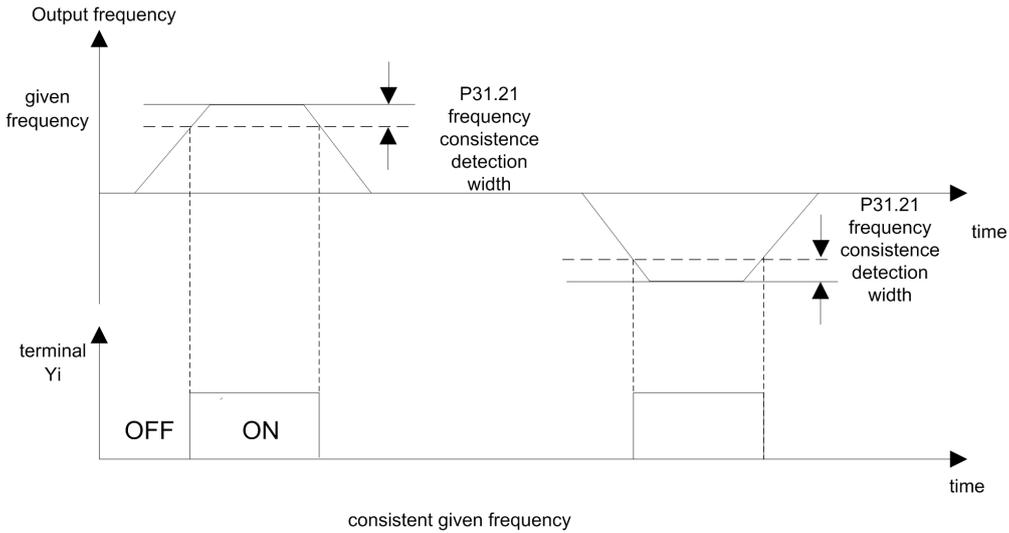


Figure 7-16 Frequency consistence detection 1

P31.22 and P31.23 are two parameters for any frequency detection: any frequency detection speed and any frequency detection width, whose combination is used for frequency/speed consistency, frequency detection 1 and frequency detection 2, to measure whether the inverter output frequency is in a specified frequency range. In frequency detection 1, when the inverter output frequency reaches or exceeds frequency detection speed (P31.22) + frequency detection width (P31.23), frequency detection 1 is triggered; after the related output point takes action and the inverter output frequency drops to frequency detection speed (P31.22), frequency detection 1 resets. Frequency detection 1 is negative logic, whose corresponding output status is OFF during triggering, while ON during reset.

In frequency detection 2, when the inverter output frequency reaches or exceeds frequency detection speed (P31.22), frequency detection 2 is triggered; after the related output point takes action and the inverter output frequency drops to frequency detection speed (P31.22) - frequency detection width (P31.23), frequency detection 2 resets. Frequency detection 2 is positive logic, whose corresponding output status is ON during triggering, while OFF during reset.

Set output terminal function as “5: frequency/speed consistency”, shown as the following:

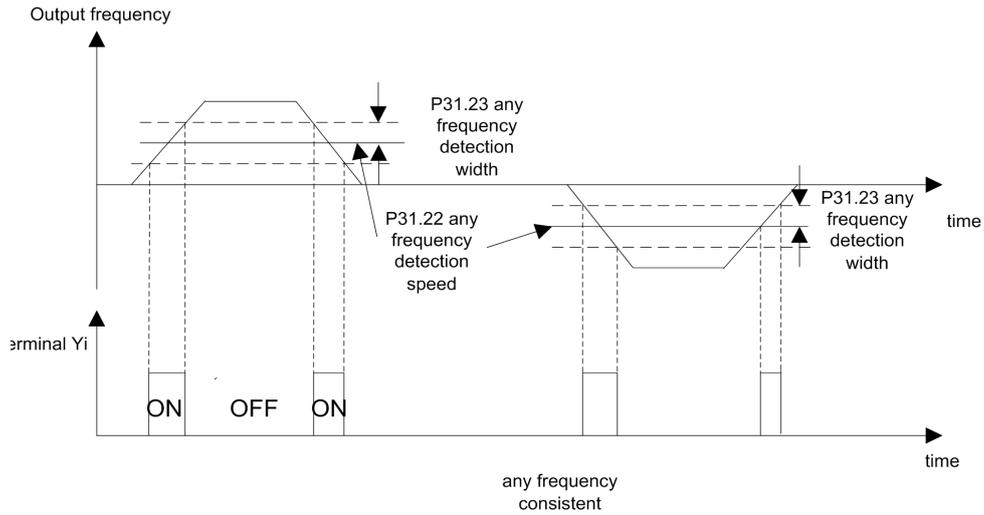


Figure 7-17 Frequency consistency detection 2

Set output terminal function as “10: speed detection 1”, shown as the figure.

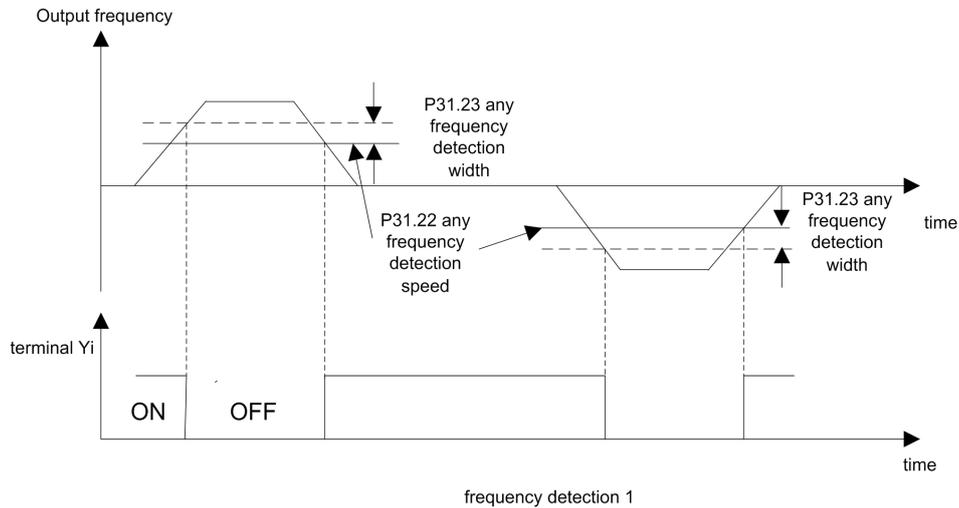


Figure 7-18 Speed detection 1

Set output terminal function as “11: speed detection 2”, shown as the figure.

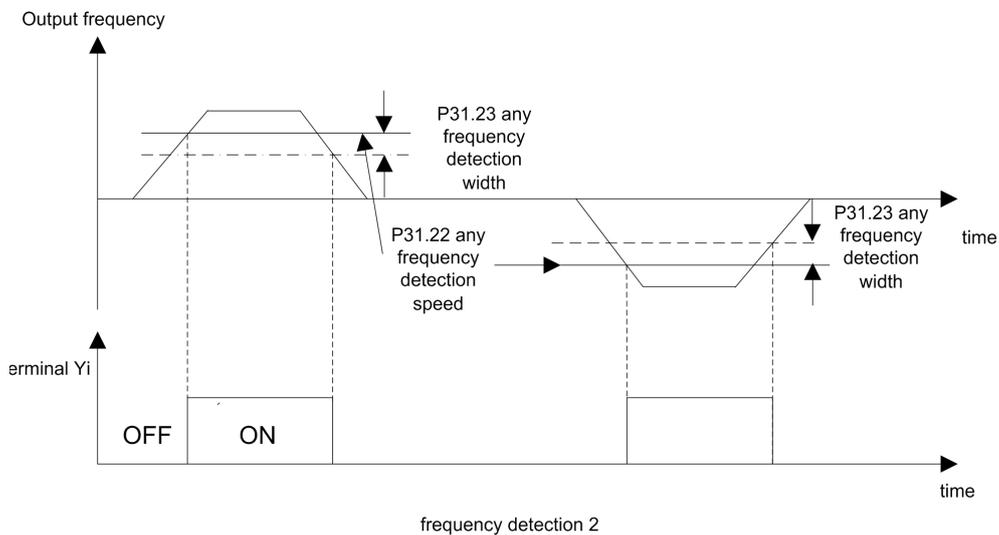


Figure 7-19 Speed detection 2

Function code	Function name	Setting range	Factory default
P31.24	Continuous running time arrive (h)	0~65535	2

Input the indicator signal after single continuous running time of the inverter arrives P31.24 from running command. Realize output indicator signal by defining the output terminal function code 27.

Function code	Function name	Setting range	Factory default
P31.25	Accumulated running time arrive (h)	0~65535	8

Output the indicator signal after accumulated running time of the inverter arrives P31.25 from electrification. Realize output indicator signal by defining the output terminal function code 26.

Function code	Function name	Setting range	Factory default
P31.26	Frequency detection 3 upper limit	0.00~300.00	0.00
P31.27	Frequency detection 3 lower limit	0.00~300.00	0.00
P31.28	Frequency detection 4 upper limit	0.00~300.00	0.00
P31.29	Frequency detection 4 lower limit	0.00~300.00	0.00
P31.30	Frequency detection 5 upper limit	0.00~300.00	0.00
P31.31	Frequency detection 5 lower limit	0.00~300.00	0.00

P31.26~P31.31 The parameter is used to set the upper and lower limit values of the frequency detection 3~5, when the frequency converter frequency is higher than the upper limit value, the corresponding output terminal is switched on, and when the frequency of the frequency converter is lower than the lower limit value, the output terminal is disconnected.

7.6.3 Group P32 Analog Input Parameters

Function code	Function name	Setting range	Factory default
P32.00	A0 input type	0~3	1
P32.06	A1 input type	0~3	1

Need to set analog input type parameters:

Voltage input A0 and A1: 0: 0 ~ 10V; 1: -10V ~ 10V;

Current input: 2: 0~20mA; 3: 4~20mA.

Function code	Function name	Setting range	Factory default
P32.01	A0 input function selection	0~6	0
P32.07	A1 input function selection	0~6	0

P32.01, P32.07 set input function for analog AI:

0: no-function

1: target speed signal

2: current speed signal

3: torque signal

4: compensation torque signal

When frequency given mode P10.03=3, 5, 7, A0 and A1 will be automatically set as 1

When frequency given mode P10.03=4, 6, 8, A0 and A1 will be automatically set as 2

When torque given mode P10.04=1, 2, 3, A0 and A1 will be automatically set as 3

When compensation torque given mode P10.05=2, 3, 4, A0 and A1 will be automatically set as 4.

5: speed limit signal

6: motor PTC signal

Function code	Function name	Setting range	Factory default
P32.02	A0 offset(V)	0.000~20.000	10.000
P32.03	A0 gain(%)	0.1~1000.0	100.0
P32.04	A0 filtering time (ms)	0~65535	10
P32.05	A0amplitude limit (V)	0.000~20.000	10.000
P32.08	A1offset (V)	0.000~10.000	10.000
P32.09	A1 gain (%)	0.1~1000.0	100.0
P32.10	A1 filtering time (ms)	0~65535	10
P32.11	A1 amplitude limit(V)	0.000~10.000	10.000

P32.02 ~ P32.05 and P32.08 ~ P32.11 are used to set offset, gain, filtering time and amplitude limit for two analog input ports separately.

Offset concludes: voltage type: 0.000 offset-10.000V; 10.000 offset 0V; 20.000 offset +10.000V,

Gain is a proportionality coefficient, it is 100% typically.

Proper adjustment of **filtering time** can improve anti-interference ability of terminal input, because analog input via A0 and A1 is provided with interference signal in field applications, yet the longer the filtering time of the terminal, the longer its response delay.

Amplitude limit is only to limit the analog input final processing signal within a scope with certain control need, for current type, it needs to change amplitude limit as 20.000mA.

Actual input = analog input * gain + offset

Example 1: analog input 0~10V is speed given, whose actual corresponding input power is 0-the maximum motor frequency P20.13, need to set gain 100% and offset 10.000V

Example 2: analog input 1~10V is speed given, whose actual corresponding input frequency is 0-the maximum motor frequency P20.13, need to set gain 100% and offset 9.000V

7.6.4 Group P33 Analog Output Parameters

Function code	Function name	Setting range	Factory default
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P33.00	M0 output function selection	0~16	1
P33.03	M1 output function selection	0~16	2

Analog DAC monitoring digital output 0-1000 represents 0-10.00V

Function definition list of multi-function analog output (partial common monitoring data):

Function set	Definition	Corresponding relation
0	No-function	
1	Output current	0~Ie corresponding to 0~10V
2	Output voltage	0~Ue corresponding to 0~10V
3	Torque given	0~Te corresponding to 0~10V
4	Bus voltage	0~Udc corresponding to 0~10V
5	Output total power	0~P corresponding to 0~10V
6	Output active power	0~Pe corresponding to 0~10V
7	Current speed (no sign)	0~Ne corresponding to 0~10V
8	Speed given (with sign)	0~Ne corresponding to 0~10V
9	Speed feedback (with sign)	0~Ne corresponding to 0~10V
10	Acceleration	0~50Hz/s corresponding to 0~10V
11	Radiator temperature	0~100°C corresponding to 0~10V
12	Analog A0	0~10V corresponding to output 0~10V
13	Analog A1 input	0~10V corresponding to output 0~10V
14	Analog A2 (spare)	0~10V corresponding to 0~10V
15	ModBus analog output 0	0~10000 corresponding to 0~10V
16	ModBus analog output 1	0~10000 corresponding to 0~10V

Function code	Function name	Setting range	Factory default
P33.01	M0 offset (V)	0.00~20.00	15.00
P33.02	M0 gain (%)	0.1~6000.0	100.0
P33.04	M1 offset (V)	0.00~20.00	15.00
P33.05	M1 gain (%)	0.1~6000.0	100.0

This function can be used to adjust the analog output defined in the above table. Analog after adjustment is the actual output of terminal M.

Differing from other function code, adjustment of the above parameters will exert real-time influence on M output.

Output correction mode of M0 and M1 is the same.

Actual output = M output * gain + offset

Actual output voltage range -10V~10V

When the parameters have been set:

Example 1: output is frequency 0~50.00Hz (rated frequency)

Set the gain as 100% and the offset as 15.000V

Actual output voltage is 0V for 0Hz, 5V for 50.00Hz

Example 2: output is frequency 0~50.00Hz (rated frequency)

Set the gain as 200% and the offset as 15.000V

Actual output voltage is 0V for 0Hz, 10V for 50.00Hz

Example 3: output is output current 0~2Ie (rated current)

Set the gain as 50% and the offset as 15.000V

Actual output voltage is 0V for 0A , 2Ie for 5V.

Function code	Function name	Setting range	Factory default
P33.06	M0 analog output type	0~4	0
P33.07	M1 analog output type	0~4	0

P33.06 and P33.07 are used to select analog output type:

0: no selection; 1: 0~10V; 2: -10V~10V; 3: 0~20mA; 4: 4~20mA.

Automatically set the corresponding analog output offset and gain, as well as default corresponding output 0-rated current/speed, etc. after type selection;

1: 0~10V default: offset 15.000 gain 200.0%

2: -10V~10V default: offset 15.000 gain 200.0%

3: 0~20mA default: offset 10.500 gain 385.0%

4: 4~20mA default: offset 12.150 gain 312.0%

7.7 Group P4X Speed Parameter Groups

7.7.1 Group P40 Basic Speed Parameters

Function code	Function name	Setting range	Factory default
P40.00	Panel speed	0.0~300.0	5.0

Panel given starting speed can be changed with button.

Function code	Function name	Setting range	Factory default
P40.01	Basic frequency	0.0~300.0	50.0

Basic running frequency is the corresponding minimum frequency when the inverter outputs the maximum voltage. When the standard AC motor is applied, it corresponds to the motor rated frequency, refer to the motor nameplate.

Function code	Function name	Setting range	Factory default
P40.02	Acceleration time 0 (s)	0.10~360.00	5.00
P40.03	Deceleration time 0 (s)	0.10~360.00	5.00

The function sets the frequency from accelerated running to constant speed or from constant decelerated running to stop after the inverter starts to run.

Acceleration time 0: the time P40.02 of the inverter output frequency increasing from zero frequency to the maximum frequency

Deceleration time 0: the time P40.03 of the inverter output frequency decreasing from the maximum frequency to zero frequency

Function code	Function name	Setting range	Factory default
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Function code	Function name	Setting range	Factory default
P40.04	Acceleration time 1 (s)	0.10~360.00	5.00
P40.05	Deceleration time 1 (s)	0.10~360.00	5.00
P40.06	Acceleration time 2 (s)	0.10~360.00	5.00
P40.07	Deceleration time 2 (s)	0.10~360.00	5.00
P40.08	Acceleration time 3 (s)	0.10~360.00	5.00
P40.09	Deceleration time 3 (s)	0.10~360.00	5.00

Besides the acceleration time 0 (P40.2) and deceleration time 0 (40.03) defined above, additional 3 groups of acceleration time and deceleration time (acceleration time 1 and deceleration time 1, acceleration time 2 and deceleration time 2, acceleration time 3 and deceleration time 3) can be defined, to select the different acceleration and deceleration in different terminal status by means of defining the multifunctional terminal X (acceleration and deceleration time selection function 1 ~ 2). Meaning of these 3 groups of acceleration time and deceleration time is the same as P40.02 and P40.03.

Function code	Function name	Setting range	Factory default
P40.10	Acceleration circular arc 0 (s)	0.00~10.00	0.00
P40.11	Acceleration circular arc 1 (s)	0.00~10.00	0.00
P40.12	Deceleration circular arc 0 (s)	0.00~10.00	0.00
P40.13	Deceleration circular arc 1 (s)	0.00~10.00	0.00

Acceleration and deceleration circular arc: to improve the time P40.10-P40.13 of arc segment increased due to smoothness of starting and terminate section during acceleration and deceleration. Segmental arc curve time applies to the conveyor belt transporting fragile goods or the applications requiring smooth speed control.

P40.10 ~ P40.13 are to set S curve (speed curve) during motor running under switching multi-speed given, they specify the acceleration time (P40.02), deceleration time (P40.03), acceleration circular arc time (P40.10 and P40.11) and deceleration circular arc time (P40.12 and P40.13), which directly affect the characteristics of S curve, therefore directly relating to the motor running efficiency and seating comfort. Specific position of the above parameters in motor running S speed curve is shown as Figure 7-20.

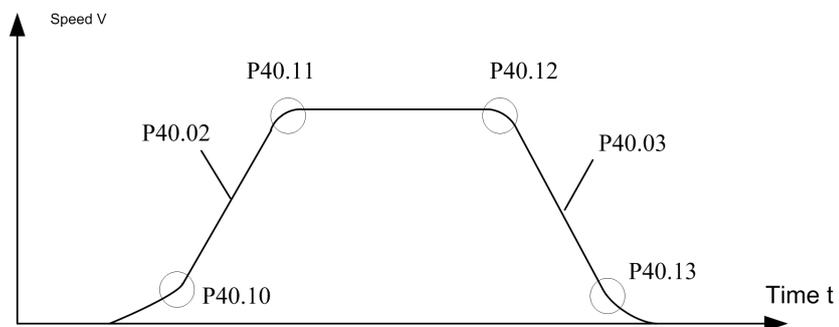


Figure 7-20 Position of S curve in motor running

7.7.2 Group P41 Digital Multi-speed Parameters

Function code	Function name	Setting range	Factory default
P41.00	Digital multi-speed given 0(Hz)	0.00~300.00	0.00
P41.01	Digital multi-speed given 1(Hz)	0.00~300.00	5.00
P41.02	Digital multi-speed given 2(Hz)	0.00~300.00	10.00
P41.03	Digital multi-speed given 3(Hz)	0.00~300.00	20.00
P41.04	Digital multi-speed given 4(Hz)	0.00~300.00	30.00
P41.05	Digital multi-speed given 5(Hz)	0.00~300.00	40.00
P41.06	Digital multi-speed given 6(Hz)	0.00~300.00	50.00
P41.07	Digital multi-speed given 7(Hz)	0.00~300.00	60.00
P41.08	Digital multi-speed given 8(Hz)	0.00~300.00	0.00
P41.09	Digital multi-speed given 9(Hz)	0.00~300.00	0.00
P41.10	Digital multi-speed given 10(Hz)	0.00~300.00	0.00
P41.11	Digital multi-speed given 11(Hz)	0.00~300.00	0.00
P41.12	Digital multi-speed given 12(Hz)	0.00~300.00	0.00
P41.13	Digital multi-speed given 13(Hz)	0.00~300.00	0.00
P41.14	Digital multi-speed given 14(Hz)	0.00~300.00	0.00
P41.15	Digital multi-speed given 15(Hz)	0.00~300.00	0.00

They can be considered as process open loop frequency given, to select different multistage frequency given in different terminal status by defining the multifunctional terminal X (digital multistage 0 ~ 3). ON means the valid terminal, OFF means the invalid terminal.

Note: during process open loop running, if input terminal function sets analog and digital multistage simultaneously, then the digital multistage shares high priority.

P41.00 ~ P41.15 respectively defines the speed command value of digital multi-speed given 1 ~ 15. Four input point binary system codes of switching multi-speed given 0 ~ 3 combine 16 kinds of status, which are corresponding to the above 15 given speed commands from P41.00 to P41.15 and 0 given speed (combination code=0). Corresponding relation between multi-speed input port signal and given speed given is shown as Table 6.2.

Table 6.2 Corresponding relation between multi-speed input port combination and given speed

Multi-speed combination code	Multi-speed given 3	Multi-speed given 2	Multi-speed given 1	Multi-speed given 0	Given speed
0	0	0	0	0	Given speed 0
1	0	0	0	1	Given speed 1
2	0	0	1	0	Given speed 2
3	0	0	1	1	Given speed 3
4	0	1	0	0	Given speed 4
5	0	1	0	1	Given speed 5

6	0	1	1	0	Given speed 6
7	0	1	1	1	Given speed 7
8	1	0	0	0	Given speed 8
9	1	0	0	1	Given speed 9
10	1	0	1	0	Given speed 10
11	1	0	1	1	Given speed 11
12	1	1	0	0	Given speed 12
13	1	1	0	1	Given speed 13
14	1	1	1	0	Given speed 14
15	1	1	1	1	Given speed 15

In the table, status 0 shows no signal at input port; status 1 shows input signal at input port. Further explanation with an example: if speed given 0 has input signal, speed given 1 has input signal, speed given 2 has no input signal and speed given 3 has no input signal, then binary coding will be “0011”=3, whose corresponding given speed is given speed 3, and its given speed value will be appointed by P41.03.

Function code	Name	Setting range	Default value
P41.16	Inching frequency given (Hz)	0.00~50.00	5.00

Frequency set value set by inching operation.

7.8 Group P5X Process Control Parameter Groups

7.8.1 Group P50 Process Open Loop Parameters

Function code	Function name	Setting range	Factory default
P50.00	Open loop auxiliary given mode	0~5	0

Select process open loop auxiliary given mode P50.00 as following:

0: nil; 1: A0; 2: A1; 3: spare; 4: spare; 5: PID given target speed

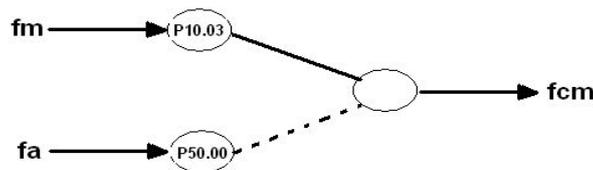


Figure 7-21 Schematic of open loop auxiliary given

P10.03 main given value f_m gives f_c , input 44 via the digital: open loop main and auxiliary given are switched to auxiliary given value, the main given value f_m is switched to auxiliary given value f_a .

Function code	Function name	Setting range	Factory default
P50.01	Open loop given main and auxiliary relation calculation	0~6	0

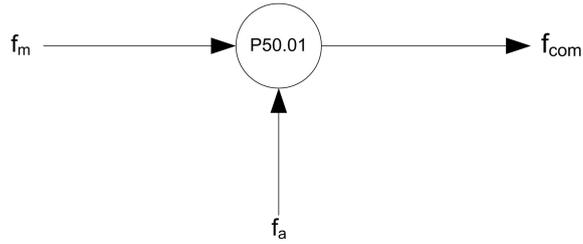


Figure 7-22 Schematic of open loop main and auxiliary given combination

Under the process open loop control mode, an auxiliary given value f_a is overlaid on the main given value f_m , to generate process open loop combination frequency given $f_{com}=f_m+f_a$.

Main given value f_m and auxiliary given value f_a are able to have addition, subtraction, offset, maximization and minimization calculation.

Process loop given main and auxiliary relation calculation P50.01 is defined as follows:

0: no calculation

1: main given + auxiliary given: auxiliary frequency given value is overlaid on the main given, with the function “plus”.

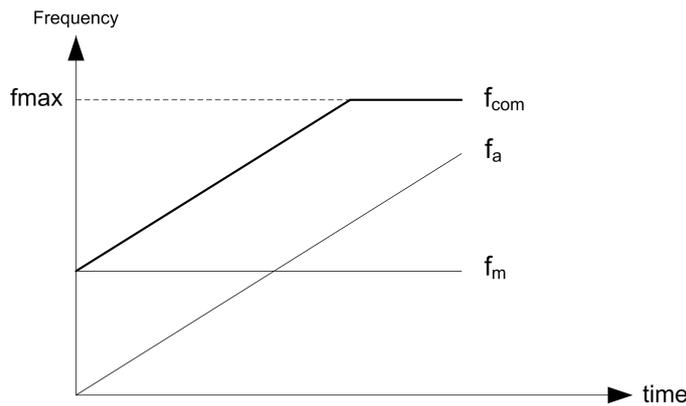


Figure 7-23 Open loop main and auxiliary given calculation 0

Process open loop combination given $f_{com}=\text{main given } f_m+\text{auxiliary given } f_a$

2: Main given-auxiliary given: auxiliary frequency given value is overlaid on the main given, with the function “minus”.

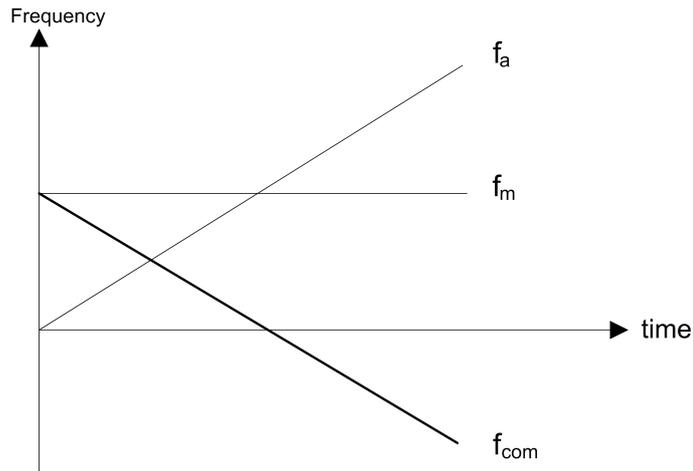


Figure 7-24 Open loop main and auxiliary given calculation 1

Process open loop combination given $f_{com} = \text{main given } f_m - \text{auxiliary given } f_a$

3: spare. 4: spare.

5: maximization: take the maximum value from the main given f_m and auxiliary

given f_a .

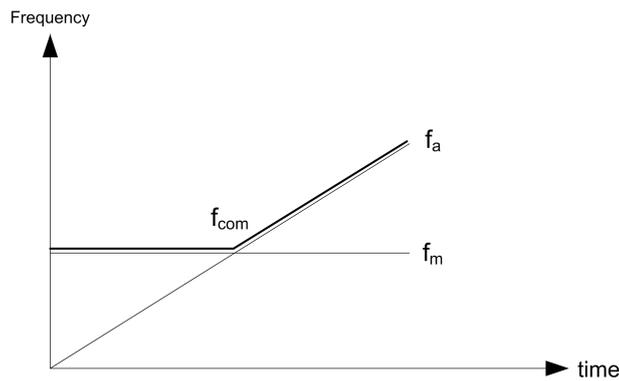


Figure 7-25 Open loop main and auxiliary given calculation 4

Process open loop combination given $f_{com} = \text{Max} \{ \text{main given } f_m, \text{auxiliary given } f_a \}$

6: Minimization: take the minimum value from the main given f_m and auxiliary

given f_a .

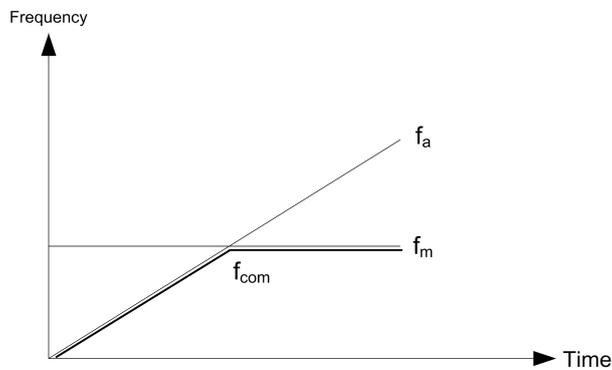


Figure 7-26 Open loop main and auxiliary given calculation 5

Process open loop combination given $f_{com} = \text{Min} \{ \text{main given } f_m, \text{auxiliary given } f_a \}$

Note: when the frequency corresponding to the resultant f_{com} exceeds the upper and lower frequency limit, output frequency is limited to the upper and lower limit.

7.8.2 Group P51 Process Close Loop Parameters

PID control is a common method for process control, to have proportional calculation, integral calculation and differential calculation for the feedback signal of controlled variable and the deviation of target signal, so as to adjust the inverter frequency and form negative feedback system, making the controlled volume to be more than the target volume. This method applies to flow control, pressure control and temperature control. The basic control functional block diagram is shown as:

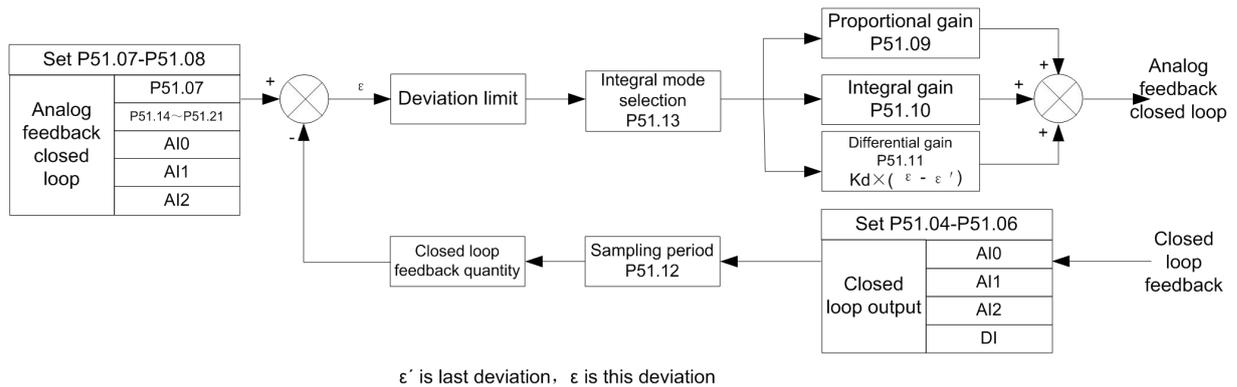


Figure 7-27 PID functional block diagram

Function code	Function name	Setting range	Factory default
P51.00	Closed loop run control selection	0~1	0

Closed loop running control selection

0: invalid

1: valid

Function code	Function name	Setting range	Factory default
P51.01	Closed loop control main given mode	0~6	0
P51.02	Closed loop control auxiliary given mode	0~6	2
P51.03	Closed loop given main and auxiliary calculation	0~6	0

In the closed loop system with feedback, if main and auxiliary given are available, the main given value may be internal given, analog and communication; and the auxiliary given value may be analog and communication.

P51.01 closed loop control main given mode selection is shown as:

0: internal given (P51.07); 1: A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication

P51.02 closed loop control auxiliary given mode selection is shown as:

0: nil; 1: A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication given;

P51.03 closed loop control given main and auxiliary calculation selection is shown as:

0: no calculation; 1: main+auxiliary; 2: main-auxiliary; 3: spare; 4: spare; 5: take the maximum value; 6: take the minimum value

Closed loop given main and auxiliary function is the same as open loop given main and auxiliary calculation function, see details of P50.01.

Note: closed control analog main given, auxiliary given, main feedback and auxiliary feedback can't be set as the same channel.

Function code	Function name	Setting range	Factory default
P51.04	Closed loop control main feedback mode	0~6	1
P51.05	Closed loop control auxiliary feedback mode	0~6	2
P51.06	Closed loop control feedback main and auxiliary calculation	0~6	0

In the closed loop system with feedback, the main and auxiliary feedback may be analog or pulse quantity. Process closed loop feedback main and auxiliary calculation function is the same as that of closed loop and process open loop given, see the details of P50.01.

P51.04: closed loop control main feedback mode selection is shown as:

0: nil; 1: A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication given;

P51.05: closed loop control auxiliary feedback mode selection is shown as:

0: nil; A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication given;

P51.06 closed loop control feedback main and auxiliary calculation selection is shown as:

0: no calculation; 1: main +auxiliary; 2: main-auxiliary; 3: spare; 4: spare; 5: take the maximum value; 6: take the minimum value

Note: closed control analog main given, auxiliary given, main feedback and auxiliary feedback can't be set as the same channel.

Function code	Function name	Setting range	Factory default
P51.07	PID internal given value	0.00~10.00	0.70
P51.08	Unit	0~3	0

Before determine the process closed loop given quantity, firstly the current control running mode P51.00=1 shall be determined firstly. When the current control running mode is analog feedback process closed loop, if P51.00 is set as 0, then the closed loop given quantity is determined by P51.07.

Function code	Function name	Setting range	Factory default
P51.09	Proportional gain Kp	0.000~10.000	0.500
P51.10	Integral gain Ki	0.000~10.000	0.500
P51.11	Differential gain Kd	0.000~10.000	0.000

The bigger the Kp, the faster the response, but oscillation may be caused if it is too big. Kp isn't able to eliminate the deviation completely, Ki may be adopted to eliminate the residual deviation; the bigger the Ki, the faster response to the deviation of the inverter, but oscillation may be caused if it is too big. If hopping feedback appears in system, Kd is required, which is able to rapidly response to the system feedback and

given deviation change. The bigger the Kd, the faster the response, but oscillation may be caused if it is too big. On-line modification and E2ron operation will be executed.

Function code	Function name	Setting range	Factory default
P51.13	Integral selection mode	0~1	0

The function determines the specific operation mode during process closed loop regulation.

If output of the process closed loop regulation reaches upper or lower frequency limit (P70.00 or P70.01), two actions for selection are available in integration element.

0: Stop integral regulation if frequency reaches the upper or lower limit; integral quantity keeps unchanged, if the trend between given quantity and feedback quantity changes, integral quantity will change rapidly with this trend.

1: Continue integral regulation if frequency reaches the upper or lower limit; integral quantity makes real-time response to the change between given quantity and feedback quantity, unless the internal integral limit has been reached. When the trend between given quantity and feedback quantity changes, more time is needed to offset the influence of continued integral, therefore the integral quantity is able to follow change of the trend.

Function code	Function name	Setting range	Factory default
P51.22	Integral action upper limit (%)	0~	100.00
P51.24	Closed loop input upper limit (%)	0~	50.0
P51.25	Closed loop input lower limit (%)	0.0~20.0	0.0
P51.26	Closed loop output upper limit (%)	0.0~	100.0

P51.22 is used with P51.13, when P51.13=1, limit value set by P51.22 shall be valid.

P51.23 closed loop output reverse selection: spare

P51.24 ~ P51.26 set limit value in process closed loop control, regulate it according to the upper limit if it exceeds P51.24, while no PID regulation is made if it is below the lower limit, set the limit value in process closed loop control.

P51.27 closed loop output lower limit: spare.

Function code	Function name	Setting range	Factory default
P51.28	Sleep selection	0~1	0
P51.29	Sleep frequency(Hz)	0.00~50.00	30.00
P51.30	Sleep delay(s)	0.00~655.35	10.00
P51.31	Wake up deviation(%)	0.00~100.00	0.10
P51.32	Wake up delay(s)	0~3600.0	10.0

Sleep parameters:

P51.28 sleep selection: 0 invalid; 1 valid

When sleep selection is valid, set sleep frequency, sleep delay, wake up deviation and wake up delay.

Function code	Function name	Setting range	Factory default
P51.33	Given acceleration and deceleration time	0.0~50.0	0.0
P51.34	Closed loop output filtering time	0.00~50.000	0.01

When the closed loop given changes suddenly, regulate these two parameters to make the given control within a certain response time, so as to make the response to the closed loop process in some environment more smoothly.

Function code	Function name	Setting range	Factory default
P51.35	Minimum given quantity	0.0~100.0	0.0
P51.36	Feedback quantity corresponding to minimum given quantity	0.0~100.0	0.0
P51.37	Maximum given quantity	0.0~100.0	10.0
P51.38	Feedback quantity corresponding to maximum given quantity	0.0~100.0	10.0

P51.35 ~ P51.38 define the relation curve of analog closed loop given and expected feedback quantity, whose set value will be the percentage of the actual given and feedback quantity to the reference value (10V or 20mA).

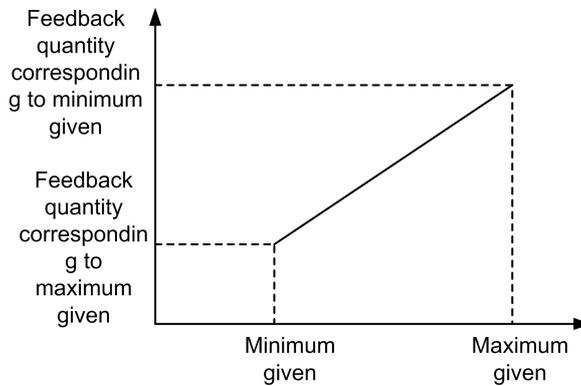


Figure 7-28 Feedback positive regulation

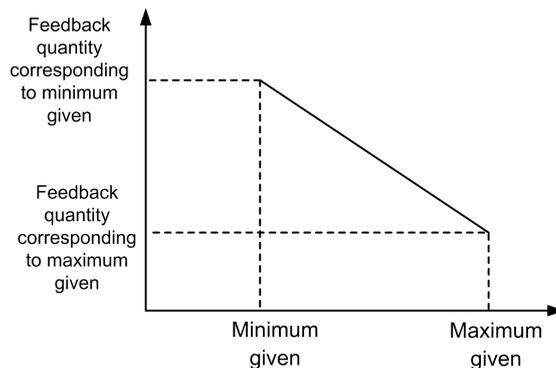


Figure 7-29 Feedback negative regulation

Function code	Function name	Setting range	Factory default
P51.39	Preset frequency (Hz)	0.001~ maximum frequency	22.0
P51.40	Preset frequency holding time (s)	0~60	0

After closed loop operation starts, the frequency firstly will be accelerated to closed loop preset frequency P51.38 according to acceleration time, then run as per the closed loop characteristics after continuously having run a period of time at this frequency point. If closed loop preset frequency function isn't required, preset frequency and holding time both can be set as 0.

Function code	Function name	Setting range	Factory default
P51.41	Deviation negation	0~1	0

Whether negate the comparative result from the feedback signal and the set value or not, 0: no negation; 1: deviation negation.

7.8.3 Group P52 specific parameters group of Constant pressure water supply

Function code	Function name	Setting range	Factory default
P52.00	Constant pressure water supply mode	0~2	0
P52.01	Number of motors (units)	1~3	3

P52.00 Setting the constant pressure water supply mode, 0: constant pressure water supply dedicated macro invalid; 1: constant pressure water supply more than a drag model; 2: constant pressure water supply a drag multi band sleep pump mode (sleep pump power frequency start)

P52.01 Set the number of motors in the constant pressure water supply system, and the sleeping pump is not included in this quantity.

Function code	Function name	Setting range	Factory default
P52.02	Plus Pump frequency (Hz)	0.00~ Maximum motor frequency	49.5
P52.03	Reduce Pump frequency (Hz)	0.00~ Maximum motor frequency	20
P52.04	Plus Pump Delay (s)	0.0~6553.5	15.0
P52.05	Reduce pump Delay (s)	0.0~6553.5	15.0

P52.02~P52.05 Set constant pressure water supply system, , plus or reduce the frequency and time delay of the pump, set according to the actual conditions.

Function code	Function name	Setting range	Factory default
P52.06	Auto switching time (min)	0~65535	60
P52.07	Stop turn empty time (s)	0~65535	60

P52.08	Prohibit subtraction pump time (s)	0~65535	3
P52.09	Switching gap time (s)	0.00~655.35	0.5

P52.06 Set constant pressure water supply system in the timing of the rotation of the time, when a pump running continuously to achieve

P52.06 Time hour, such as the system has idle pump, then the inverter automatically stops the current pump, go to the idle pump operation.

P52.07 Set the wait time for the pump motor to be shut down and then turn to the idle pump to prevent the motor from running after it has just stopped.

P52.08 Set Water Supply System continuously add, subtract the pump wait time, to prevent the continuous addition, subtraction pump pressure on mutations.

P52.09 Set the frequency conversion pump to switch to the power frequency of the clearance time

Function code	Function name	Setting range	Factory default
P52.10	Pressure tolerance (%)	0.0~100.0	1.0
P52.11	Sleep pump pressure tolerance (%)	0.0~100.0	1.0
P52.12	Plus sleep pump delay (s)	0.0~6553.5	5.0
P52.13	Reduce sleep pump delay (s)	0.0~6553.5	5.0

P52.10 A constant pressure water supply system with a given pressure and feed back pressure to allow the value of the deviation, when the feedback pressure of the given pressure > pressure tolerance, the frequency of the frequency of the inverter, until the pump; when when the feedback pressure of the given pressure >the feedback pressure + pressure tolerance, the frequency converter frequency decreases, until the pump or sleep.

P52.11 Set the resting pump start and stop to allow the given pressure and the feedback pressure of the deviation value, when the feedback pressure > given pressure + sleep pump pressure tolerance, the sleep pump stops, when the feedback pressure of the given pressure - the pressure tolerance of the pump, the sleep pump operation.

P52.12、 P52.13 Set the delay time to add and subtract the sleep pump.

7.9 Group P6X Vector Control Parameter Groups

7.9.1 Group P60 Speed Control Parameters

Function code	Function name	Setting range	Factory default
P60.00	Speed loop zero speed P	0.00~655.35	0.00
P60.01	Speed loop zero speed I	0.00~655.35	0.00

Function code	Function name	Setting range	Factory default
P60.02	Speed loop zero speed D	0.00~655.35	0.00
P60.03	Speed loop low speed P	0.00~655.35	100.00
P60.04	Speed loop low speed I	0.00~655.35	5.00
P60.05	Speed loop low speed D	0.00~655.35	0.50
P60.06	Speed loop medium speed P	0.00~655.35	70.00
P60.07	Speed loop medium speed I	0.00~655.35	2.00

P61 Parameter group mainly on the current loop PID regulation, generally do not adjust, in accordance with the default settings

7.9.2 Group P61 Current Control Parameters

Function code	Function name	Setting range	Factory default
P61.00	Current loop Kp	0.01~9.99	1.40
P61.01	Current loop Ki	0.01~9.99	1.00
P61.02	Current loop Kd	0.00~9.99	0.00
P61.03	Current loop bandwidth (Hz)	0.1~1000.0	400.0
P61.04	Magnetic link bandwidth (Hz)	0.1~1000.0	0.8
P61.05	Current loop selection	0~10	0
P61.06	V/F control current loop Max	0.0~100.0	1.0
P61.07	V/F control current loop Min	0.0~100.0	1.0

Group P61 mainly carries out PID regulatin for current loop, typically no regulation provides and set it according to the default.

7.9.3 Group P62 Torque Control Parameters

Function code	Function name	Setting range	Factory default
P62.00	Digital torque given (%)	0.0~100.0	0.0
P62.01	Torque direction	0~1	0
P62.02	Torque increase time (s)	0.01~655.35	1.00
P62.03	Torque decrease time (s)	0.01~655.35	1.00

When P10.00=2, the four parameters can be used:

When torque given mode P10.04=0, torque, direction, acceleraiton and deceleration time are determined by P62.00, P61.01, P62.02 and P62.03 respectively.

7.9.4 Group P63 Torque Compensation Parameters

Function code	Function name	Setting range	Factory default
P63.00	Compensation torque direction	0~1	0
P63.01	Compensation gain (%)	0.0~200.0	100.0
P63.02	Compensation offset (%)	0.0~100.0	0.0
P63.03	Light load switch compensation (%)	0.0~99.9	0.0

Function code	Function name	Setting range	Factory default
P63.04	Heavy load switch compensation (%)	0.0~99.9	0.0

When P10.05 is set as nonzero, these 5 parameters can be used, to compensate the proportional and deviation calculation according to given compensation channel.

Compensation gain is a proportional coefficient and offset is the regulation on deviation.

Light load and heavy load switch compensation are used for elevator industry. When digital quantity is used to compensate torque function, light load switch action is to compensate light load torque, while the heavy load switch action is to compensate heavy load torque.

7.9.5 Group P64 Position Control Parameters (spare)

7.10 Group P7X Enhanced Control Parameter Groups

7.10.1 Group P70 Limit and Protection Parameters

Function code	Function name	Setting range	Factory default
P70.00	Upper frequency limit (Hz)	0.01~ max frequency	50.00
P70.01	Lower frequency limit (Hz)	0.01~ Upper frequency limit	0.00
P70.02	Maximum output frequency (Hz)	0.01~300.00	55.00

Maximum output frequency f_{max} is the highest frequency permitted to be output by the inverter.

Maximum output voltage V_{max} is the output voltage when the inverter is running at the basic running frequency. If a standard AC motor is applied, it is the motor rated voltage, see the motor nameplate.

Upper and lower frequency limit f_H and f_L are the highest and lowest frequency set for the motor operation as required by production process during application of the user.

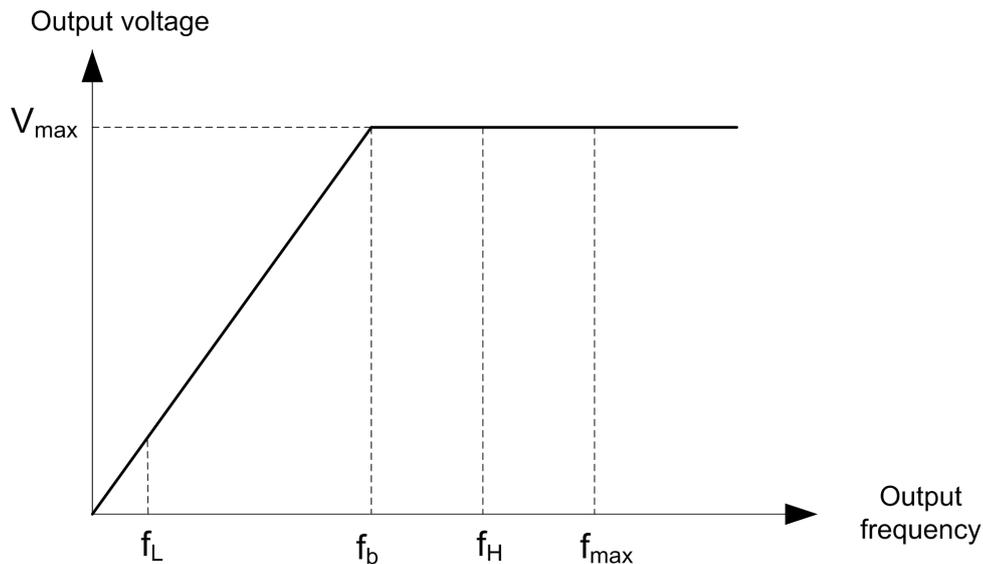


Figure 7-35 Schematic of the upper and lower frequency limit

Function code	Function name	Setting range	Factory default
P70.04	Output torque limit (%)	0.00~200.00	150.00
P70.05	Inverter acceleration overcurrent threshold value (%)	0.00~200.00	160.00
P70.06	Inverter deceleration overvoltage threshold value (V)	540~800	750
P70.07	Overspeed protection coefficient (%)	0.00~	120.00

P70.04 ~ P70.06 set overcurrent and overvoltage threshold for the inverter. In general, when the set speed or the motor load experiences rapid change, output current of the inverter may be greater than the overcurrent protection point, resulting overcurrent fault. Current limit function is that the inverter limits output current with sudden change not greater than the protection action value by means of controlling the transient output, so as to effectively reduce overcurrent fault and guarantee the continuous and reliable operation of the system. When the current exceeds a certain value (P70.04), the inverter enters current limit status; during the constant speed operation, load capacity may be ensured via current limit, free from any overcurrent fault. When the load is reduced, the inverter automatically exits from current limit status and restores to normal operation. The function is especially suitable in the applications with rapid speed or load change.

Function code	Function name	Setting range	Factory default
P70.08	Special function selection	0~65535	16

Set the parameter according to bit, with its specific meaning as: for example 16, indicating the classic speed loop selected for speed loop.

bit3: 8 whether calculate the rotor time constant based on the motor parameters or not (1: based on motor parameters; 0: based on slip frequency);

bit4: 16 Small speed drop for sudden increased load; small speed increase for sudden decreased load.

bit5: 32 undervoltage alarm (1: no alarm; 0: alarm)

bit7: 128 zero servo mode (1: calculate zero servo torque based on acceleration; 0: calculate zero servo torque based on feedback speed)

bit8: 256 encoder phase angle self-learning for every operation (1: Y; 0: once only for electrification)

bit10: 1024 bus voltage compensation for the emergency power operation (1: compensation; 0: no compensation)

Function code	Function name	Setting range	Factory default
P70.10	PT signal channel	0~2	0
P70.11	PT protection upper threshold (V)	0.000~10.000	10.000
P70.12	PT protection lower threshold(V)	0.000~10.000	0.000
P70.13	PT protection action delay (s)	0.0~10.0	3.0

PT70.10 : PT signal channel selection (0: NC 1: AI0 2: AI1).

Triggering conditions for 49# fault (PT detection fault): after the inverter has run for 5s, “PT > P70.11” or “PT < P70.12” will continue the time set in P70.13;

Clearing conditions for 49# fault (PT detection fault): the inverter stops or clear the fault after “P70.12<PT P70.11” continues for 2s.

Function code	Function name	Setting range	Factory default
P70.14	HT signal channel	0~2	0
P70.15	HT protection upper threshold (V)	0.000~10.000	10.000
P70.16	HT protection lower threshold(V)	0.000~10.000	0.000
P70.17	HT protection action delay (s)	0.0~10.0	3.0

HT signal channel selection (0: NC 1: AI0 2: AI1).

Triggering conditions for 50# fault (Humidity fault): “HT > P70.15” or “PT < P70.16” continues the time set in P70.17.

Clearing conditions for 50# fault (Humidity fault): “P70.16<PT <P70.15”; clear the fault after it is continues for 2s.

Function code	Function name	Setting range	Factory default
P70.18	Bus undervoltage threshold (V)	0~540	380

400V bus undervoltage threshold default is 380V.

Function code	Function name	Setting range	Factory default
P70.21	PWM detection delay (s)	0~65535	800

After the inverter starts to run, if output current is 0 and after parameter PWM detection delay, the inverter sends 51# fault.

Function code	Function name	Setting range	Factory default
P70.22	Selection below the tower frequency limit	0~3	0

Set the running mode when target frequency is below the lower frequency limit:

0: run at the lower frequency limit;

1: stop;

2: run at zero speed;

3: inertia stop;

Function code	Function name	Setting range	Factory default
P70.23	Limit current limit frequency current given	120	0~65535
P70.24	current limit Kp	0.0~0.015	0.0001
P70.25	current limit Ki	0.0~0.2000	0.0001
P70.26	current limit OutMin	0.0~6553.5	2.0
P70.27	current limit Recovery value	0~100	10
P70.28	Limit current limit frequency	0~65535	10

	voltage given	
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70.28 Limit voltage drop frequency voltage given, with P70.08

When bit0 P70.08 = 1, enable the function of the current limiting frequency

When Bit1 P70.08 = 1, Enable limit drop-frequency function

7.10.2 Group P71 Control Optimization Parameters

Function code	Function name	Setting range	Factory default
P71.00	Frequency hopping speed 1(Hz)	0.00~100.00	0.00
P71.01	Frequency hopping speed 2(Hz)	0.00~100.00	0.00
P71.02	Frequency hopping speed 3(Hz)	0.00~100.00	0.00
P71.03	Frequency hopping speed (Hz)	0.00~100.00	0.00

In order to avoid the mechanical resonance point, set the frequency hopping range for the inverter. The inverter set frequency will be automatically adjusted to frequency hopping section to run when it drops into the frequency hopping. Frequency hopping section ranges from frequency hopping speed - 0.5 * frequency hopping width to frequency modulation speed + 0.5 * frequency hopping width, with 3 frequency modulation sections set totally.

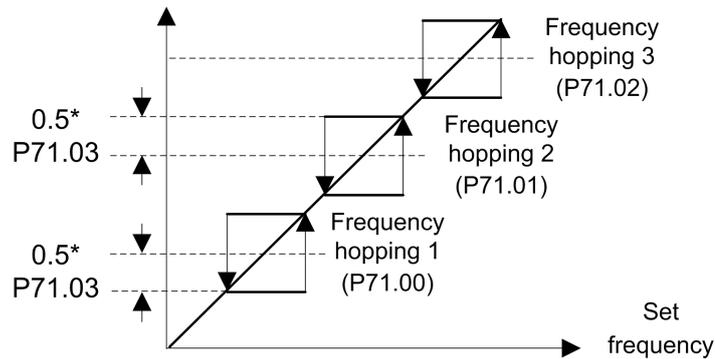


Figure 7-36 Upper and lower frequency hopping limit

Function code	Function name	Setting range	Factory default
P71.04	Inertia compensation factor (%)	0.00~100.00	0.00
P71.05	No reverse	0~1	0
P71.06	FWD and REV interval time (s)	0.0~6553.5	0.0
P71.07	PWM modulation mode(s)	0~2	2

Rotational inertia compensation factor is determined by P71.04. When the system is in torque control mode and has big system load inertia, it needs to provide the additional rotational inertia compensation during its acceleration and deceleration. For some production equipment, reverse rotation may cause equipment damage. Therefore this function may be adopted to prohibit reverse rotation.

P71.05 factory default: reverse permitted, P71.05=1: no reverse.

When rotation direction of the motor is opposite to that required by the equipment, wiring of any two terminals on output side of the inverter can be exchanged, making the forward direction of the equipment to be consistent with that defined by the inverter.

P71.06 sets the waiting time of the inverter from forward to reverse (or from reverse to forward) when the speed exceeds 0.

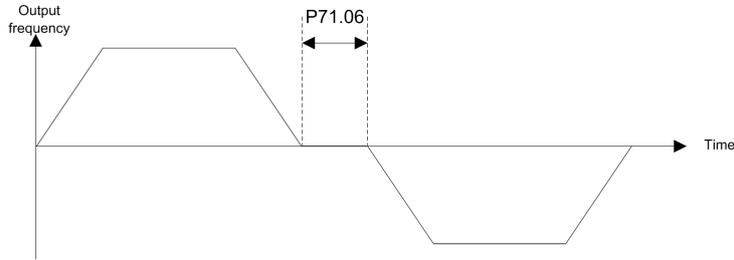


Figure 7-37 Dead time from forward to reverse

P71.07 selects PWM modulation mode. 0: 5-section type; 1: 7-section type; 2: <30%rpm 7-section, >30% rpm 5-section.

Function code	Function name	Setting range	Factory default
P71.08	V/F optimization function selection (%)	0~127	119

0: Nil

1: torque automatic lifting to improve the low speed loading performance;

2: oscillation suppression to control the motor oscillation during no load and light load;

4: slip compensation to improve speed control precision;

8: stator resistance compensation to improve the low speed loading performance;

16: dead zone compensation to improve voltage precision;

32: bus voltage compensation to stabilize the output voltage;

64: oscillation suppression 2 to control the motor oscillation during no load and

light load;

(bit selection function)

Function code	Function name	Setting range	Factory default
P71.09	V/F torque compensation (%)	0.0~30.0	0.0
P71.10	V/F compensation maximum frequency (Hz)	0.0~50.0	10.0

P71.09 provides the manual compensation torque during V/F control, to effectively improve low speed torque

P71.10 provides the maximum frequency for compensation torque during V/F control

Function code	Function name	Setting range	Factory default
P71.11	Dead zone compensation mode	0~2	0

Dead zone compensation mode

0: compensate 100% as per angle;

1: compensate 50% as per angle;

2: make compensation as per current;

Generally no adjustment.

Function code	Function name	Setting range	Factory default
P71.12	Current slow down time (s)	0.01~655.35	0.00
P71.14	Carrier frequency (kHz)	1.1~8.0	6.0
P71.15	Random PWM width (kHz)	0.000~1.000	0.000

Setting of current slow down time may reduce the crash noise produced when the motor stops, which only applies to closed loop.

Carrier frequency regulation: when the inverter motor is too noisy, increase carrier frequency to lighten it. Random PWM width can regulate the carrier frequency section, for example: when carrier frequency is 6 and random width is 1KHz, carrier frequency randomly changes within 5.5-6.5, which also is used to reduce the motor noise.

Note: default carrier frequency of AS series is related to the inverter power, the bigger the power, the lower the default carrier frequency. If the default value is exceeded, please derate it, derating 10% for each increase of 1K.

Function code	Function name	Setting range	Factory default
P71.16	Regulator mode	0~3	1

Regulation period of speed loop when set the vector control, 0: 0.5ms, 1: 1ms, 2: 4ms 3: 4ms, the bigger the value, the slower the speed regulation, to reduce the electromagnetic noise of the motor.

Regulator mode is different according to the different default carrier frequency of the inverter. When the default carrier frequency $\geq 4\text{kHz}$, default regulation mode is 1; when the default carrier frequency $\leq 3\text{kHz}$, default regulation mode is 2.

Function code	Function name	Setting range	Factory default
P71.17	Contact on delay (s)	0.0~10.0	0.8
P71.18	Opening delay (s)	0.0~10.0	0.4
P71.19	Contact off delay (s)	0.0~10.0	1.0
P71.20	Braking delay (s)	0.0~10.0	0.1
P71.21	Output off delay (s)	0.0~10.0	0.3

These parameters mainly are used for control system, to increase control logic of output contactor and external brake. Adjustment of delay time will realize more stable control and improve the comfort.

Also these parameters can be applied in the applications provided with lifting mechanism and requiring output contactor control.

Function code	Function name	Setting range	Factory default
P71.22	Zero speed threshold (Hz)	0.0~10.0	0.2

P71.22 sets zero speed threshold, default 0.2Hz. If the actual running frequency is below the set value, then it is zero speed.

Function code	Function name	Setting range	Factory default
P71.23	Forward dead zone compensation (%)	0~100	100
P71.24	Reverse dead zone compensation (%)	0~100	100

P71.23 makes compensation for open and close switching dead zone time of the forward upper and lower bridge arm, default 100%.

P71.24 makes compensation for open and close switching dead zone time of the reverse upper and lower bridge arm, default 100%.

Function code	Function name	Setting range	Factory default
P71.29	PWM modulation selection	0~1	0

PWM modulation mode

0: underflow update

1: overflow/underflow update, carrier frequency below 4k, please set as 1.

Function code	Function name	Setting range	Factory default
P71.33	Speed precision adjustment (%)	0.0~100.0	100.0
P71.34	Performance improvement compensation	0~1000	106
P71.35	System inertia coefficient (%)	0.0~300.0	0.0
P71.36	Automatic torque lifting at low speed (%)	0.0~300.0	0.0

The above parameters are to set the characteristics of vector control 1 without speed sensor. If the acceleration and deceleration time are short, increase P71.35 to quicken speed response. If it is difficult to start, with more low speed torque requirements, please increase P71.36.

Function code	Function name	Setting range	Factory default
P71.39	Power failure detection threshold (V)	380~550	480
P71.40	KEB bus target voltage (V)	380~550	500

It is set as 480 typically. If fault is sent during KEB, refer to the inverter bus voltage and properly increase it.

This value shall be greater than P71.39 (power failure detecton threshold) and below the inverter bus voltage during normal power supply. Refer to the inverter bus voltage and properly increase it.

Function code	Function name	Setting range	Factory default
P71.41	Power failure treatment mode	0~4	0

0: no treatment;

1: track start (time limit)

2: track start (time unlimited)

3:KEB (with detection undervoltage): start to use KEB, if it exceeds P71.42

(longest power failure compenstaion time), the bus voltage is still low, then undervoltage fault will be sent.

4:KEB (no detection undervoltage)

Function code	Function name	Setting range	Factory default
P71.42	Longest power failure compenstaion time (s)	0.0~60.0	3.0

If it exceeds P71.42 (longest power failure compensation time) after KEB is used, the bus voltage is still low, then undervoltage fault will be sent.

Function code	Function name	Setting range	Factory default
P71.43	KEB shortest actuation time (ms)	0~2000	100

After KEB is used, P71.43 (KEB shortest actuation time) is required to exit KEB.

Function code	Function name	Setting range	Factory default
P71.44	KEB starting frequency reduction (Hz)	0.00~5.00	2.00

To make the motor to be in generating status quickly, set this value within 0-2 times of the motor rated slip frequency range

Function code	Function name	Setting range	Factory default
P71.45	KEB deceleration time (s)	0.00~200.00	10.0

If KEB takes action, increase this value if overvoltage appears, while decrease it if undervoltage or overcurrent appears.

Function code	Function name	Setting range	Factory default
P71.46	KEB deceleration mode	0~3	0

It does't need to set this parameter.

Function code	Function name	Setting range	Factory default
P71.47	KEB acceleration time (s)	0.00~300.00	25.00

Keep the same as the motor acceleration time set.

Set the following parameters according to the listed value, no alteration.

Function code	Function name	Setting range	Factory default
P71.48	Proportional Kp of KEB	0.00~300.00	200.00
P71.49	Integral Ki of KEB	0.00~300.00	0.00
P71.50	Differential Kd of KEB	0.00~300.00	0.00
P71.51	KEB upper integral limit (%)	0.0~300.0	100.0
P71.52	KEB lower integral limit (%)	0.0~300.0	100.0
P71.53	KEB closed loop upper output limit (%)	0.0~300.0	100.0
P71.54	KEB closed loop lower output limit (%)	0.0~300.0	100.0

Set as default value without change.

For Kp during KEB, KEB time will be too short if this value is too small, while bus overvoltage fault may be caused if it is too big.

For Ki during KEB, KEB time will be too short if this value is too small, while bus overvoltage fault may be caused if it is too big.

Function code	Function name	Setting range	Factory default
P71.55	KEB upper voltage deviation limit (V)	0.0~500.0	300.0

When KEB is enabled, deviation between bus voltage and set target voltage is limited not exceeding P71.55 (KEB upper voltage deviation limit). If it is greater than this value, then it equals to this value.

Function code	Function name	Setting range	Factory default
P71.56	KEB voltage zero deviation value (V)	0.0~10.0	0.0

Bus voltage deviation is 0 if it is less than this value.

Function code	Function Name	Range	Default value
P71.57	Variable carrier frequency threshold	0.0~50.0	0.0

P71.57 variable carrier frequency threshold, output frequency is below this value. If P71.29=0, carrier frequency drops to 3K; if P71.29=1, carrier frequency drops to 2K to run. If it is set as 0, indicating the normal carrier operation.

Function code	Function name	Setting range	Factory default
P71.58	Fan control selection	0~4	0

0: The fan operates when the inverter starts to run; when the inverter stops, the fan will stop 1 min later.

1: The fan operates when the inverter starts to run; when the inverter stops, the fan will stop 5 minutes later.

2: The fan operates when the inverter starts to run; when the inverter stops, the fan will stop 30 minutes later.

3: Fan operation conditions. The fan will operate only if the radiator is greater than 40°C; when it is below 35°C, the fan will stop after 1s delay.

4: Operate all the time after power on

Function code	Function name	Setting range	Factory default
P71.62	UP/DOWN single step length	0.00~10.00	0.10

By use of UP/DOWN function, set the variation of each step with this parameter.

7.11 Group P8X Communication Parameter Groups

7.11.1 Group P80 Communication Selection Parameters

Function code	Function name	Setting range	Factory default
P80.00	Communication mode selection	0~3	0

Select the communication mode applied by the existing inverter, default 0

0: no communication

1: Profibus-DP

2: Modbus

3: Canbus

7.11.2 Group P81 Modbus Communication Parameters

Function code	Function name	Setting range	Factory default
P81.00	Communication baud rate	0~7	3
P81.01	Data format	0~2	0

Function code	Function name	Setting range	Factory default
P81.02	Transmission mode selection	0~1	1

The inverter supports the internationally accepted Modbus protocol, RTU format. See the appendix.

P81.00 determines communication baud rate and supports 1200~57600bps.

0: 1200bps

1: 2400bps

2: 4800bps

3: 9600bps

4: 19200bps

5: 38400bps

6: 57600bps

7: 76800bps

P81.01 sets communication format, odd-even check.

0: format 1-8-1, no check.

1: format 1-8-1, even check.

2: format 1-8-1, odd check.

P81.02 sets transmission mode: 0: ASCII; 1: RTU

Function code	Function name	Setting range	Factory default
P81.04	Local address	1~247	1

P81.04 sets the local address, 0=broadcast address, the available address 1 ~ 247, the reserved address 248 ~ 255.

Function code	Function name	Setting range	Factory default
P81.07	Communication address format selection	0~1	1

Select communication address format, 0: hexadecimal number system; 1: decimal number system.

Function code	Function name	Setting range	Factory default
P81.08	Modbus specific function	0~1	0

7.11.3 Group P82 Profibus_DP Communication Parameters

Function code	Function name	Setting range	Factory default
P82.00	Local address	0~255	0
P82.01	Big and little endian mode	0~1	0

P82.00 indicates the local address

P82.01 sets the big and little endian mode

0: the higher 8 bits will be sent firstly, then the lower 8 bits

1: the lower 8 bits will be sent firstly, then the higher 8 bits

Function code	Function name	Setting range	Factory default
P82.02	Self-defined status word 1	0~59	16
P82.03	Self-defined status word 2	0~59	13
P82.04	Self-defined status word 3	0~59	10
P82.05	Self-defined status word 4	0~59	18

P82.02 ~ P82.05 set self-defined status:

- 0: running status 1
- 1: running status 2
- 2: detection status
- 3 ~ 9: spare
- 10: output torque
- 11 ~ 12: spare
- 13: target frequency given
- 14: current running frequency
- 15: feedback speed Hz
- 16: feedback speed rpm
- 17: spare
- 18: output voltage effective value
- 19: output current effective value
- 20 ~ 21: spare
- 22: output total power
- 23: bus voltage
- 24 ~ 28: spare
- 29: output terminal status
- 30: spare
- 31: input terminal status
- 32 ~ 33: spare
- 34: analog input AI0
- 35: analog input AI1
- 36: spare
- 37: output DA0
- 38: output DA1
- 39: spare
- 40: recent fault No.
- 41 ~ 42: spare
- 43: radiator temperature
- 44 ~ 59: spare

7.12 Group P9X Fault and Display Parameter Groups

7.12.1 Group P90 Language Selection Parameters

Function code	Function name	Setting range	Factory default
P90.00	Manipulator language selection	0~1	0

P90.00 language selection: 0: Chinese; 1: English;

7.12.2 Group P91 LCD Display Parameters

Function code	Function name	Setting range	Factory default
P91.00	U01 display data	0~34	20
P91.01	U02 display data	0~34	2
P91.02	U03 display data	0~34	3
P91.03	U04 display data	0~34	4
P91.04	U05 display data	0~34	6
P91.05	U06 display data	0~34	16
P91.06	U07 display data	0~34	7
P91.07	U08 display data	0~34	5
P91.08	U01-U08 监视选择	0~1	0

Display parameters of 8 LCDs are set totally, shown as the following table:

Function code	Function name	Setting range	Factory default
0	0 no-definition	1	Output speed rpm
2	Given speed Hz	3	Feedback speed Hz
4	Output current A	5	Output voltage V
6	Output torque %	7	Bus voltage V
8	Spare	9	Spare
10	Spare	11	Count value of phase AB during Z signal
12	Count value of phase AB	13	Angle of phase U
14	Pulses corresponding to CD	15	Encoder position angle
16	Pre-torque %	17	Number of interference of phase Z
18	Number of interference of phase AB	19	Running status
20	Target speed (Hz)	21	Encoder sin central point
22	Encoder cos central point	23	Weighing compensation
24	Given speed (rpm)	25	Speed variation (rpm)
26	Weighing compensation %	27	Encoder phase C central point
28	Encoder phase D central point	29	Radiator temperature
30	Input port status	31	Output port status
32	PID given value	33	PID feedback value
34	Output power		

7.12.3 Group P92 LED Display Parameters

Function code	Function name	Setting range	Factory default
P92.00	LED display data	0~34	2

See group P90 for its meaning.

7.12.4 Group P93 Running Record Parameters

Function code	Function name	Setting range	Factory default
P93.00	Accumulative local power on time (kh)	0.000~65.535	0.000
P93.01	Accumulative local running time (kh)	0.000~65.535	0.000
P93.02	Maximum radiator temperature record (°C)	0.0~100.0	0.0

The inverter will record the following information automatically: accumulative local power on time, accumulative local running time and maximum radiator temperature record.

Function code	Function name	Setting range	Factory default
P93.03	Accumulative output power of the inverter (kWh)	0.0~999.9	0.0

The inverter starts to run after power on, accumulative output power in unit time, with the unit kWh.

Function code	Function name	Setting range	Factory default
P93.04	Accumulative output power of the inverter (MWh)	0~65535	0

The inverter starts to run after power on, accumulative output power in unit time, with the unit MWh.

Function code	Function name	Setting range	Factory default
P93.05	Running time of the inverter fan (h)	0~65535	0

Running time of the inverter fan, unit h.

7.12.5 Group P94 Troubleshooting Parameters

Function code	Function name	Setting range	Factory default
P94.00	Inverter minor fault handling mode	0~3	1
P94.01	Inverter fault automatic reset time (s)	0.0~180.0	10.0
P94.02	Inverter fault automatic reset number	0~100	0

P94.00 sets fault handling mode,

0: when minor fault appears, no fault relay output;

1: when minor fault appears, fault relay output;

2: when 52#PTC fault appears, fault relay output and the inverter stops, no fault automatic reset, 3: 1 and 2 are both valid.

P94.01 sets automatic reset time, default 10s

P94.02 sets number of automatic reset during 30 min, default 0. The default value is not automatic reset, automatic reset fault may cause dangerous operation, please use carefully.

Function code	Function name	Setting range	Factory default
P94.03	Radiator overheating time (s)	0.0~180.0	0.5
P94.04	Overspeed protection time (s)	0.00~180.00	1.00
P94.05	Input phase loss voltage threshold	0~150	85
P94.06	Number of short circuit of braking resistor	0~100	10

P94.03 sets the protection time for radiator overheating protection (3# fault). When the radiator temperature exceeds 80°C, continue P94.03 time protection ;

P94.04 sets the confirm time for overspeed protection (30# fault);

P94.05 sets the judge voltage sag value for input phase loss (29# fault). When input voltage fluctuation is greater than P94.05, it can be increased in the areas with unstable grid.

P94.06 sets fault confirm number of braking resistor fault (4# fault).

Function code	Function name	Setting range	Factory default
P94.08	Input phase loss confirm time (s)	0.000~180.000	2.000
P94.09	Relay fault confirm voltage (V)	0~350	90
P94.10	Misphase judgement threshold for phase CD	300~1000	300
P94.11	ABZ protection threshold(%)	20~100	20

P94.08 input phase loss confirm time set is detected only during normal running or encoder dynamic self-learning. Time protection when phase current continuously exceeds P94.08.

P94.09 is relay fault confirm voltage, which is VDC1 when the inverter doesn't run, and VDCmax and VDCmin when the inverter runs, detected once every 20ms (VDC1-VDCmax). It is greater than 94.09 and $(VDC1-VDCmax) > (VDCmax-VDCmin) * 5$, continued for 10 times, protected.

P94.10 sets misphase judgement threshold for phase CD

(1) For SinCos encoder, difference value of AB signal and CD signal exceeds 94.10 and lasts for 500ms protection;

(2) Difference value between Endate absolute position and position of AB signal exceeds 94.10 protection.

P94.11 is ABZ protection threshold for the incremental encoder.

P10.00=3, feedback speed < 1%, for big speed error, lasted for 400ms, protected.

Function code	Function name	Setting range	Factory default
P94.12	IGBT protection number	0~65535	2

Set the number of times that the inverter output current is greater than IGBT protection current threshold (21# fault).

Function code	Function name	Setting range	Factory default
P94.13	I ² t protection selection	0~3	0

Protection selection parameter P94.13 defaults to 0, then I²t protection plays a role. If it is set as 1, only 45# or 46# protection fault, applying to frequent start or stop. If it is set as 2, only 21# or 27# protection fault, applying to continuous overload applications. If it is set to 3, no protection for I²t.

Function code	Function name	Setting range	Factory default
P94.14	Analog A0 disconnection value (%)	0.0~100.0	0.0
P94.15	Analog A1 disconnection value (%)	0.0~100.0	0.0

Analog A0/A1 input signal disconnection detection value, relative to 10V percentage. If analog A0 input voltage < 10V * P94.14/P94.15, analog input disconnects.

Function code	Function name	Setting range	Factory default
P94.16	Abnormal analog treatment	0~5	0

If the inverter sends an abnormal analog input fault, set the inverter how to run.

P94.16 set value:

- 0: no action of the inverter;
- 1: protection shutdown
- 2: run at the frequency for abnormal analog;
- 3: run at the frequency set in P70.00;
- 4: run at the frequency set in P70.01;
- 5: run at the frequency set in multi-speed 15.

P94.16=1, no automatic reset for the fault, automatic reset for others.

Function code	Function name	Setting range	Factory default
P94.17	Temperature sampling disconnection treatment	0~1	0

If the inverter sends temperature sampling disconnection fault, how does the inverter run. P94.17=0, indicating no action for the inverter; 1: protection shutdown.

Function code	Function name	Setting range	Factory default
P94.18	Communication protection	0~2	2
P94.19	Communication disconnection protection time (s)	0.000~65.535	2.000

P94.18 0: not used 1: start communication protection

0: no treatment 1: Shutdown: No Power protection 2: Shutdown: There are power protection

After the normal communication interruption lasts for P94.19, send 43# fault.

Function code	Function name	Setting range	Factory default
P94.20	Number of grounding protection (times)	0~65535	100

Set confirm times of 32# fault.

7.12.6 Group P95 Product Identification Parameters

Function code	Function name	Setting range	Factory default
P95.00	Inverter hardware version		500.04
P95.01	Control board software version		factory

Default not to use functions of the oscilloscope of the upper computer. Set P95.01 as 3728 to start the oscilloscope. Set P95.01 as 3728 again not to start the oscilloscope; it needs to reset after power failure and power on once again.

Function code	Function name	Setting range	Factory default
P95.02	Version number		100.01
P95.03	Profibus_DP software version		factory

Software and hardware version parameters of the inverter are displayed in group P95, which are set directly by the manufacturer.

7.12.7 Group P96 Inverter Product Parameters

Function code	Function name	Setting range	Factory default
P96.00	Inverter rated power (kW)	0.0~999.9	
P96.01	Inverter rated current (A)	0.0~999.9	
P96.02	Inverter maximum current (A)	0.0~999.9	
P96.03	Inverter rated voltage (V)	0~460	380
P96.04	Inverter power factor (%)	0~99	15
P96.05	Inverter sensor current (A)	0~9999	404
P96.06	Inverter module rated current (A)	0~9999	
P96.07	Built-in braking unit current (A)	0~9999	
P96.08	3-phase current balance coefficient(%)	0.800~1.200	1.000
P96.09	ID_0	0~65535	13567
P96.10	ID_1	0~65535	36773
P96.11	ID_2	0~65535	13142
P96.12	ID_3	0~65535	14387
P96.13	ID_4	0~65535	6276
P96.14	ID_5	0~65535	8259

Function code	Function name	Setting range	Factory default
P96.15	ID_6	0~65535	19
P96.16	Special parameter	0~65535	90

Fixed parameters of the inverter are displayed in group P96, which are set directly by the manufacturer:

P96.00 ~ P96.04, initially set by the manufacturer;

P96.05 ~ P96.16, parameter setting of the inverter itself, determined by hardware, read-only.

Chapter 8 Fault Check

This chapter describes inverter faults, fault codes, contents, reasons and their solutions in details, and provides analysis flow chart for all kinds of faults during motor adjusting or operating.

Danger

Ⓢ **Maintenance operation should start 10 minutes after power supply is cut off. At that time, charging indicator must be off completely or voltage of DC bus is lower than 24 VDC.**

Or it may cause electric shock.

Ⓢ **To retrofit inverter privately is absolutely prohibited.**

Or it may cause electric shock or human injury.

Ⓢ **Only professional electrician can perform maintenance operation. Leaving cable stub or metal obstacle inside inverter is prohibited.**

Or it may cause fire hazard

Notice

Ⓢ **Don't change wiring and connect/disconnect terminal blocks during power on.**

Or it may cause electric shock.

8.1 The Function of Protection and Check

When inverter fault occurs, fault LED on top of digital operator blinks. LED displays the current fault code.

Inverter has total 39 fault codes. Fault list table 8.1 shows the fault codes and their reasons, solutions.

Table 8.1 Fault list

Fault code	Fault display	Possible reason	Solution
1	Module over-current protection	Too high voltage at DC terminal	Check network power for fast stop under high inertia load, no dynamic braking
		Possible short connection to peripheral circuit	Check any short circuit between motor and output connection, grounding
		Losing output phase	Check any loose connection for motor and output
		Encoder fault	Check encoder or its wiring
		Hardware poor contact or damage	Need maintenance by professional technician
		Internal component loose	Need maintenance by professional technician
		The power circuit components overheat due to the cooling fan or cooling system problem.	Check the cooling fan. Check whether the cooling fan power is blocked by dirt or foreign object.
		Warning: The inverter must started only after eliminating the malfunction causes, avoiding the damage to IGBTs	
2	ADC fault	Current sensor damaged	Replace current sensor
		Problem of current sampling loop	Replace control board
3	Heatsink overheat	Ambient temperature too high	Reduce ambient temperature, increase ventilation. Keep the surrounding temperature below 40 °C or according to this character to test the capacity of the inverter.
		The cooling fan damaged or foreign object entered into the cooling system.	Check whether the fan power cable is well connected, or replace the same model fan or remove the foreign objects.
		Cooling fan is abnormal	Check the cooling fan. Check whether the cooling fan power is correct and whether there is any foreign object blocking the fan.
		Temperature detect circuit fault	Need maintenance by professional technician
4	Braking unit failure	Braking unit damaged	Replace related driving module or control circuit board
		External braking resistor circuit short	Replace the resistance or the wiring connection
5	Blown fuse failure	Fuse blown by high current	Check the fuse circuit connection, or looseness of connectors

Fault code	Fault display	Possible reason	Solution
6	Over torque output	Too low input voltage	Check input power supply
		Motor stop rotating or abrupt loading change	Prevent motor stopping, reduce abrupt loading change
		Encoder failure	Check encoder or its wiring
		Missing output phase	Check the loose connection of motor and output wiring
7	Speed deviation	Too short acceleration time	Extend acceleration time
		Too high load	Reduce load
		Too low current limit	Increase current limit under allowed range
8	Bus over voltage protection (in acceleration running)	Abnormal input voltage	Check input power supply
		Re-rapid starting during motor in high speed rotating	Wait till motor stop rotating, and re-start
	Bus over voltage protection (in deceleration running)	Too high load rotational inertia	Select proper energy consumed braking component
		Too short deceleration time	Extend deceleration time
		Too high braking resistance or no resistor	Connect proper braking resistor
	Bus over voltage protection (running at constant speed)	Abnormal input power	Check input power supply
		Too large load rotational inertia	Select proper energy consumed braking component
		Too high braking resistance or no resistor	Connect proper braking resistor
	9	Bus undervoltage	Power voltage lower than minimum equipment working voltage
Instantaneous power off			Check input power supply, reset and restart after input power back to normal
Too high fluctuation of input power voltage			
Loose power connection block			Check input wiring
Internal switch power abnormal			Need maintenance by professional technician
A large starting current load existing in the same power supply system			Alter power system to conform the specification

Fault code	Fault display	Possible reason	Solution
10	Loss of output phase	Abnormal wiring at inverter output, missing or breaking connection	Check wiring at inverter output side based on operation procedure, eliminate missing, breaking connection
		Loose output terminal block	
		Insufficient motor power, less than 1/20 of maximum applicable inverter motor capacity	Adjust the capacity of inverter or motor
		Unbalanced three phase output	Check the motor wiring
Check the consistency of characteristic of inverter output side and DC side terminals			
11	Motor over current at low speed (during acceleration)	Low network voltage	Check input power supply
		Improper motor parameter setting	Set proper motor parameters
		Rapid start during motor running	Restart after motor stop running
		The acceleration time for load inertia (GD2) is too short.	Extend the acceleration time
	Motor over current at low speed (during deceleration)	Low network voltage	Check input power supply
		Too large load rotational inertia	Select proper energy consumed braking component
		Improper motor parameter setting	Set proper motor parameters
		Too short deceleration time	Extend deceleration time
		The deceleration time for load inertia (GD2) is too short	Prolong the slowdown time
	Motor over current at low speed (during constant speed)	Abrupt load change in running	Reduce frequency and amplitude of abrupt load change
Improper motor parameter setting		Set proper motor parameters	
12	Encoder failure	Incorrect encoder connection	Correct wiring encoder
		Encoder no signal output	Check encoder and power supply
		Encoder wire disconnected	Re-connect
		Abnormal function code setting	Ensure the proper encoder function code setting

Fault code	Fault display	Possible reason	Solution
13	Current detected at stopping	Current keep on flowing while motor stops	Slip happens by motor
			Need maintenance by professional technician
14	Reversed speed during operation	Reversed speed during operation	Check the abrupt change of external load
		Phase differed between encoder and motor	Change motor or phase order
		Motor reversed by starting, current reaches the limit	Current limitation is too low or motor unmatched
15	Speed detected at stopping	Elevator slip due to loose brake	Check brake
		Encoder interfered or loose	Tighten encoder, eliminate interference
16	Wrong motor phase	Motor reversed connected	Correct connection or adjust parameter
17	Over speed in the same direction (in maximum allowed speed)	Wrong encoder parameter or interference	Check encoder circuit
		Too large positive load or abrupt load change	Check the reason for abrupt load change
18	Over speed in opposite direction (in maximum allowed speed)	Wrong encoder parameter or interference	Check encoder circuit
		Too large reversed load or abrupt load change	Check the reason for abrupt load change
19	UVW encoder wrong phase order	Incorrect encoder connection or wrong parameter	Check connection or change parameter
20	Encoder communication fault	Encoder fault	Check encoder wiring and re-do encoder self-learning
21	abc over current (3 phase instantaneous value)	Motor single phase shorted to earth	Check motor and output circuit
		Encoder fault	Check encoder and correct wiring
		Test loop of drive board fault	Replace drive board
22	Brake detection fault	Inactive output relay	Check relay control loop
		Relay triggered, brake not released	Check the brake power string for loosening or breaks
		No signal detected by feedback component	Tune feedback component

Fault code	Fault display	Possible reason	Solution
23	Input over-voltage	Too high input voltage	Check whether input voltage matches inverter rating
		Problem by detection loop of switch voltage	Need maintenance by professional technician
24	UVW encoder wire broken	Encoder wiring fault	Wiring block loose or wire broken in connection
25	Reserved for future use		
27	Output over current (valid value)	Too long time operation under overload status. The larger the load, the shorter the time is.	Stop for a while, if problem occurs again after re-operation, check to ensure the load in allowed range.
		Motor blocked	Check motor or brake
		Motor coil short	Check motor
		Output short	Check wiring or motor
28	SIN/COS encoder fault	Damaged encoder or wrong wiring	Check encoder and its wiring
29	Loss input phase	Abnormal voltage at input side	Check grid voltage
		Loss input voltage phase	
		Input terminal block loose	Check input terminal wiring
30	Over speed protection (exceed maximum protected speed limit)	Wrong encoder parameter set or interference	Check encoder circuit
		Abrupt load change	Check the external reason for abrupt load change
		Wrong parameter for over speed protection	Check parameter
31	Over current at motor high speed	Power grid voltage too low	Check input power supply
		Abrupt load in operation	Reduce frequency and amplitude of abrupt load change
		Incorrect motor parameter	Set motor parameter correctly
		Wrong encoder parameter or interference	Check encoder circuit
32	Grounding	Wrong wiring	Refer to user manual, correct the wrong wiring

Fault code	Fault display	Possible reason	Solution
	protection	Abnormal motor	Replace motor, to have a grounding isolation test first
		Large drain current to earth at inverter output side	Need maintenance by professional technician
33	Capacitor aged	Inverter capacitor aged	Need maintenance by professional technician
34	External fault	External fault signal input	Check the reason for external fault
35	Unbalance output	Abnormal wiring at inverter output side, missing or broking connection	Check inverter output side wiring follow the operation procedure, eliminate possible missing, broking connection
		Motor three phase unbalance	Check motor
36	Wrong parameter setting	Wrong parameter setting	Modify inverter parameter
37	Current sensor fault	Drive board hardware fault	Need maintenance by professional technician
38	Brake resistor short	Connection of external brake resistor short	Check the wiring of brake resistor
39	Too high instantaneous current	Three phase instantaneous current over and alarm while Ia, Ib and Ic not in operation	Need maintenance by professional technician
40	KMY detection fault	KMY detect contactor signal and KMY control signal don't match	Check the contactor of KMY control and KMY detection
41	Brake switch detection fault	Brake switch detect contactor signal and its control signal don't match	Check brake switch
42	IGBT short circuit protection	She cause is the same as Fault 1.	Check short circuit for motor and output wiring, grounding
43	Communication fault	Communication disconnected No communication data received within the fixed time	Check the communication signal line
44	The input power supply is abnormal	1. The input power supply changes a lot 2. Input contactor abnormally connected 3. Temporary electricity	1. Check the power supply 2. Check input contactor
45	I2t instantaneous over current protection	Same as fault 21,27	Same as fault 21,27

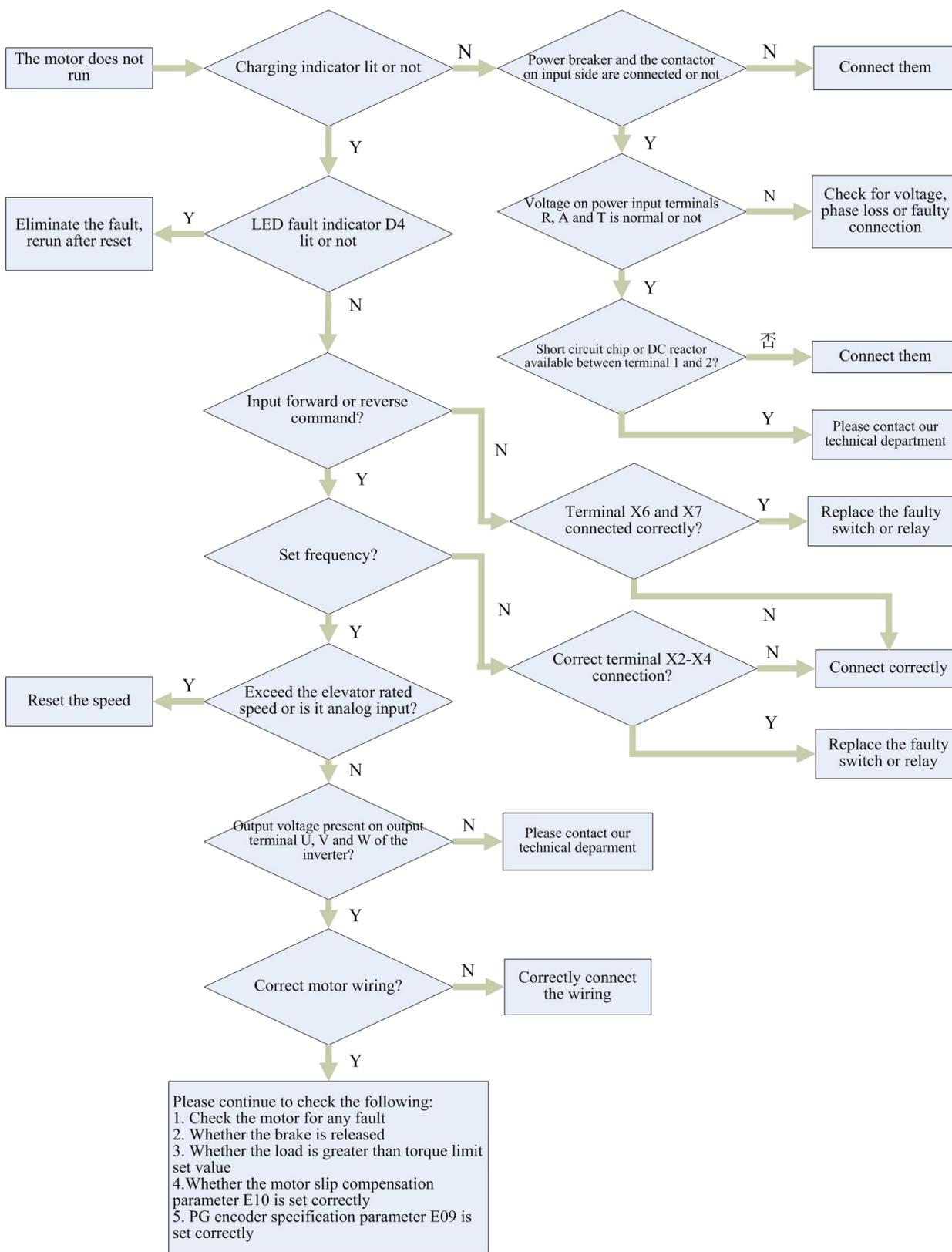
Fault code	Fault display	Possible reason	Solution
46	I2t valid over current protection		
47	Abnormal analog input	Analog input signal disconnected Abnormal analog input signal	1. Modify the related parameters 2. Check analog input signal
48	Temperature sampling disconnection	Radiator temperature sampling disconnected	Check connection of temperature sampling
49	PT detection fault	PT input signal disconnected Abnormal PT input signal	Check PT input signal Modify the related parameters
50	Humidity fault	HT input signal disconnected Abnormal HT input signal	1. Check HT input signal 2. Modify the related parameters
51	Abnormal running output current	Improper parameter setting Disconnection between the inverter and the motor Inverter hardware fault	Check P70.21 Check the connecting line Ask the professionals to have maintenance
52	Motor PTC overheat warning	Motor continuous overload Small motor model Abnormal PTC	Check the load Calculate the motor model Check PTC

8.2 Fault Diagnosis Flow Chart

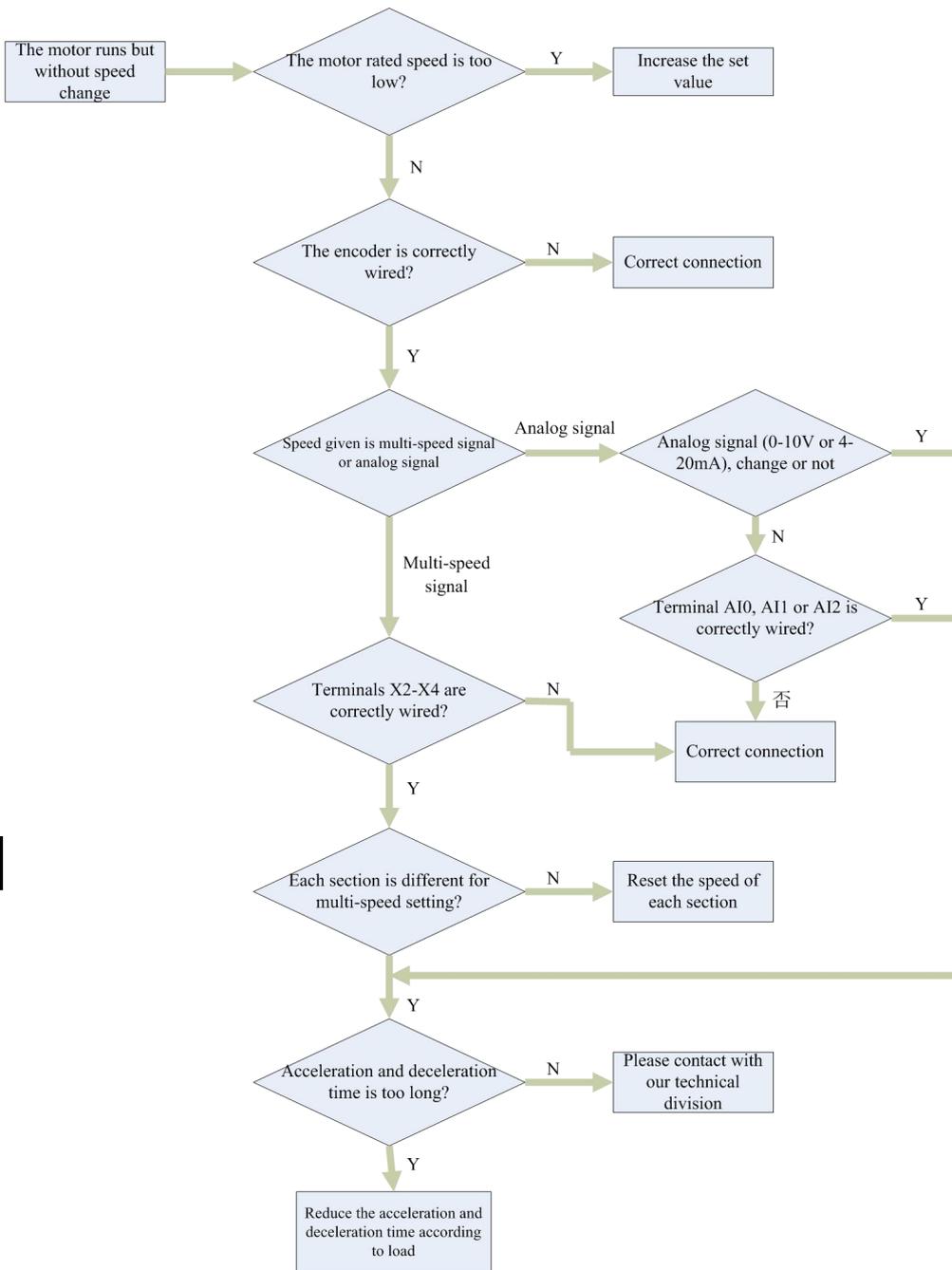
Because of the reasons of parameter setting, wrong wiring, inverter and motor might not run in a preset condition at first start. In this case please refer to the introduction in this section about the fault diagnosis procedure, to have fault analysis and handling.

Abnormal motor running:

- Motor doesn't run when running command at control terminal block is sent.



■ Motor runs but doesn't have speed change.



Chapter 9 Service and Maintenance

This chapter introduces the general information about service and maintenance.

Danger

⊙ **Maintenance should be started 10 minutes after power off. The charge indicator should be fully off and DC bus voltage should be below 24 VDC.**

Or it may cause electric shock.

⊙ **Never remould inverter unauthorizedly.**

Or it may cause electric shock and human injury

⊙ **Only professional electrician can operate the product maintenance. Never leave any wire stubs, metal pieces inside the inverter.**

Or it may cause fire hazard.

Notice

⊙ **Do not alter wiring and remove wiring terminal while power is on.**

Or it may cause electric shock

9.1 Warranty

Our company provides warranty service if inverter (main body) has the following situation:

Our company will be responsible for the repairs within the warranty period (counted date from leaving factory) if inverter has failure or damage in normal operation condition. An appropriate maintenance cost will be charged if the warranty period is due.

If the failure was caused by following reasons, a certain cost will occur even within warranty period:

- 1) Problem caused by not follow up instruction manual or unauthorized repair or alter
- 2) Problem caused by over specified limit usage
- 3) Drop the product or transport damage
- 4) Damage caused by earthquake, fire hazard, flood, lighting, abnormal voltage or other natural disasters, or its affiliate reason

9.2 Product Inquiry

If product damages, has fault or other problem, please contact to our office or customer service department and prepare the following information:

Inverter Model

Serial number

Date of purchase

Information needs to be provided: damage description, unclear question and fault occurred

9.3 Routine Check

Inverter hull can't be taken off during energizing or operation. To observe the state of operation can only go through visual check. The following items can be routinely checked:

- 1) Does ambient environment fulfill standard specification?
- 2) Does operation conform to the standard specification?
- 3) Any abnormal noise, vibration or others?
- 4) Proper working cooling fan installed in inverter?
- 5) Any over-heat situation?

9.4 Periodic Check

To start a periodic check, inverter should stop operating, switch off power, then remove the hull. The charging capacitor in main circuit may still have charged voltage and needs time to discharge it. Therefore the check operation can only start after charging indicator is off and DC bus voltage measured by multimeter is lower than safety value (below 24VDC).

There will be an electric shock hazard if you touch the terminal block right after power off.

Table 9-1 lists the items needed to be periodic check.

Table 9-1 Periodic check item

Area		Item	Method	Judgment
Operation environment		1) Ensure ambient temperature, humidity, vibration, check any dust, corrosive gas, oil mist or water drop, etc 2) Any dangerous goods in surrounding area	1) Visual check, thermometer, hydrometer 2) Visual Check	1) Ambient temperature lower than 40°C. Humidity and other environment index meet the requirements 2) No dangerous good
LCD display		1) Is LCD clearly displayed? Even backlight? 2) Any missing letter in screen?	Visual check	1) Even backlight 2) Correct display
Connector Terminal block, bolt		1) Loosening bolt 2) Loosening connector	1) Tightening 2) Visual check	1) Normal condition 2) Secured installation
Main circuit	Wire	1) Shielded layer broken or faded 2) Deformed copper connector	Visual check	Normal condition
	Electromagnetic contactor, relay	1) Has vibration sound in operation 2) Is contact point proper closed	Hearing check, visual check	1) No 2) Can hear contactor closing
	Charging capacitor	1) Any leaking, color change, crack and swollen enclosure 2) Does safety valve go out? Any swollen on it?	Visual check	Normal condition
	Heatsink	1) Is dust piled up? 2) Air duct blocked or attached by foreign object	Visual check	Normal condition
	Cooling fan	1) Any abnormal noise 2) Any abnormal vibration 3) Color changed due to overheat	1) Hearing, visual check. Manual turn fan blade after power off. 2) Visual check 3) Visual check, olfaction check	1) Rotating smoothly 2), 3) no abnormalities
Control circuit	Connection component	Any dust or attached foreign object on two row terminal strip between control board and main circuit	Visual check	Normal condition
	Control board	1) Any color change or odor smell on control PCB 2) Any crack, damage, deform on PCB	1) Visual Check, olfaction check 2) Visual check	Normal condition

Appendix A Inverter EMC Installation Guide

This appendix introduces EMC inverter design, installation from aspects of noise suppression, wiring requirement, grounding, peripheral equipment surge absorption, current leakage, install area dividing, installation precaution, using power filter, and radiation noise treatment.

A.1 Noise Suppression

The principle of inverter decides that a certain noise may produce. The effect to the peripheral equipments depends on the type of noise, noise transmission path, design and installation of kinetic system, wiring and grounding.

A.1.1 Types of Noise

Types of noise see Fig. A-1.

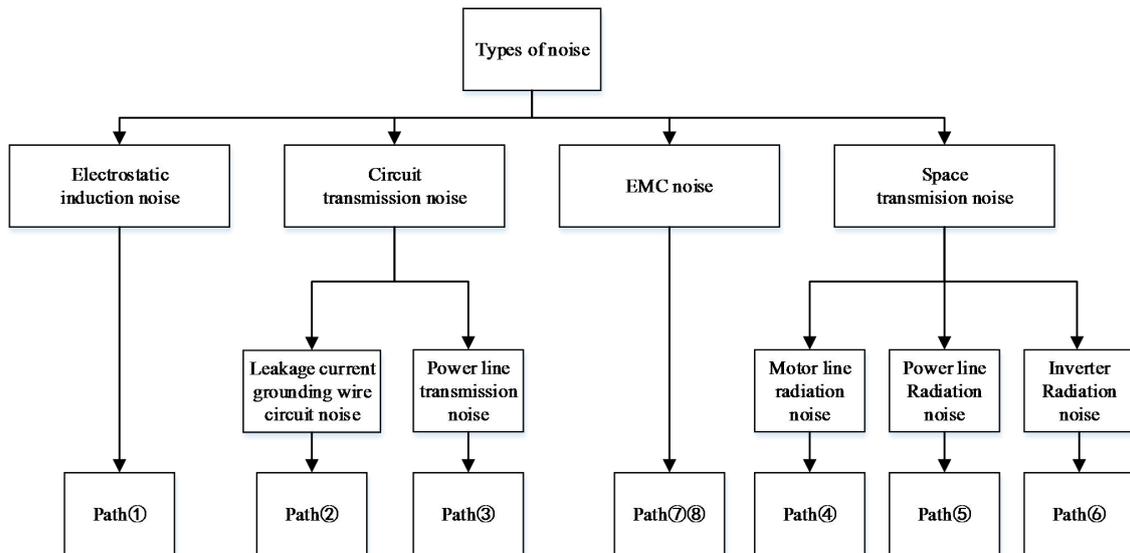


Fig. A-1 Diagram for noise type

A.1.2 Noise Transmission Route

Noise transmission path see Fig. A-2.

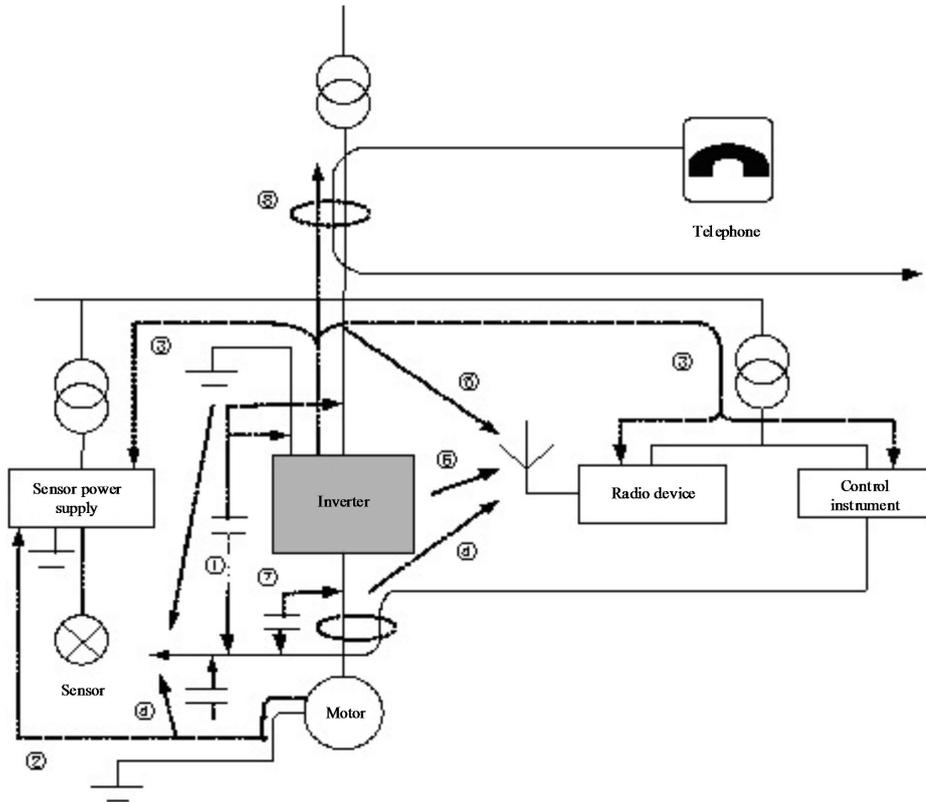


Fig. A-2 Noise transmission route

A.1.3 Basic Method for Noise Suppression

Basic methods against noise suppression see Table A-1.

Table A-1 Basic countermeasure for noise suppression

N	Cause	Countermeasure
① ⑦ ⑧	If signal cable runs in parallel with power cable or they are bundled, noise will be transmitted in signal cable due to the electromagnetic induction and static induction. Peripheral device may be wrongly triggered.	1) Avoid signal cable and power cable in parallel running, or bundled; 2) Keep susceptible peripheral device far away from inverter; 3) Lay easy affected signal cable far away from inverter input/output power cable; 4) Use shielded wire for signal cable and power cable. It is better to insert into metal tube separately (minimum 20 cm between metal tubes)
②	If the peripheral device becomes a close loop circuit by wiring to inverter, the inverter grounding current leakage will cause wrong action of the peripheral device.	Don't ground the peripheral device can avoid the wrong action caused by current leakage
③	If the peripheral device shares the same power supply with inverter, noise created by inverter can be transmitted along the power cable. The peripheral devices linked in the system may cause wrong action.	Install a noise filter at inverter input side, or use isolate transformer/power filter to other peripheral devices for noise isolation

<p>④ If weak current peripheral devices, such as control computer, gauges, radio device, sensor and their cable are installed in the same cabinet with inverter, and their wiring is closed to the inverter, radiate interference may cause wrong action.</p> <p>⑤</p> <p>⑥</p>	<p>1) Easy affected peripheral devices and their cable should be installed far away from inverter. Shielded cable should be used for signal cable and shielded layer grounds to the earth. Signal cable inserts into metal tube and away from inverter and its input/output power cable. A perpendicular cross must be wired in case of inevitable cable crossing between signal cable and power cable.</p> <p>2) To install radio noise filter or linear noise filter (Ferrite Common Mode Choke) on both input and output side of inverter can suppress radiated noise of inverter input and output power cable.</p> <p>3) Cable from inverter to motor should be inserted into a thick shield of 2mm or thicker, or be buried in a cement groove. Cable should be inserted into a metal tube and its shield should be grounded (4 core cable can be taken for motor wiring, one core grounds to earth at inverter side and connects to the motor enclosure at the other end).</p>
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A.2 Wiring Requirement

A.2.1 Requirement for Cable Laying

In order to avoid mutual coupling of interference, control signal cable should be laid separately from power cable and as far as possible from them. Fig. A-3(a) shows this situation. Fig. A-3(b) shows that a perpendicular cross must be ensured when a signal cable must pass a power cable of power supply or motor.

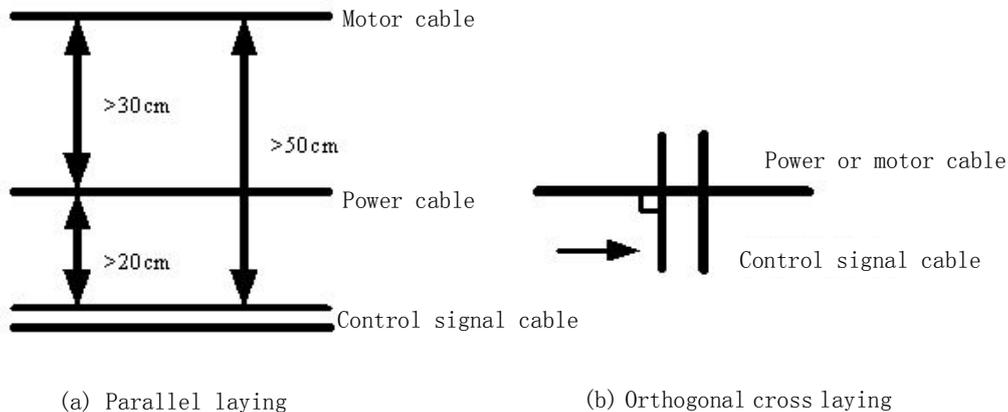


Fig. A-3 Wiring requirement

A.2.2 Requirement for Cable Cross Section Area

The larger the cable cross section is, the larger the earth capacitance, and the higher the ground current leakage will be. If the cross section of motor power cable is too large, motor should be used with decreased rating and reduces the output current (reduce 5% of current for each increasing level of cross section).

A.2.3 Requirement for Shielded Cable

High frequency, low impedance, shielded armor cable, such as copper mesh, aluminum mesh, should be used.

A.2.4 Installation Requirement for Shielded Cable

Normally control cable should be a shielded cable, and shielded metal mesh should be connected to metal cabinet by 360° ring type clamp fixed. Fig. A-4 shows the correct connection. Shielded connection shown in Fig. A-5 is wrong.

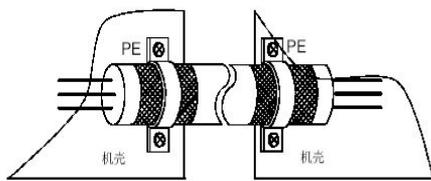


Fig. A-4 Correct shielded grounding

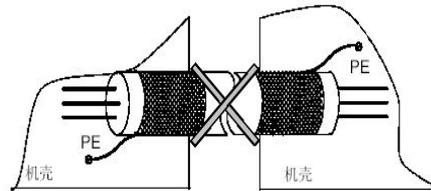


Fig. A-5 Incorrect shielded grounding

A.3 Grounding

A.3.1 Type of Grounding

Fig. A.6 lists the methods for electrode to ground.

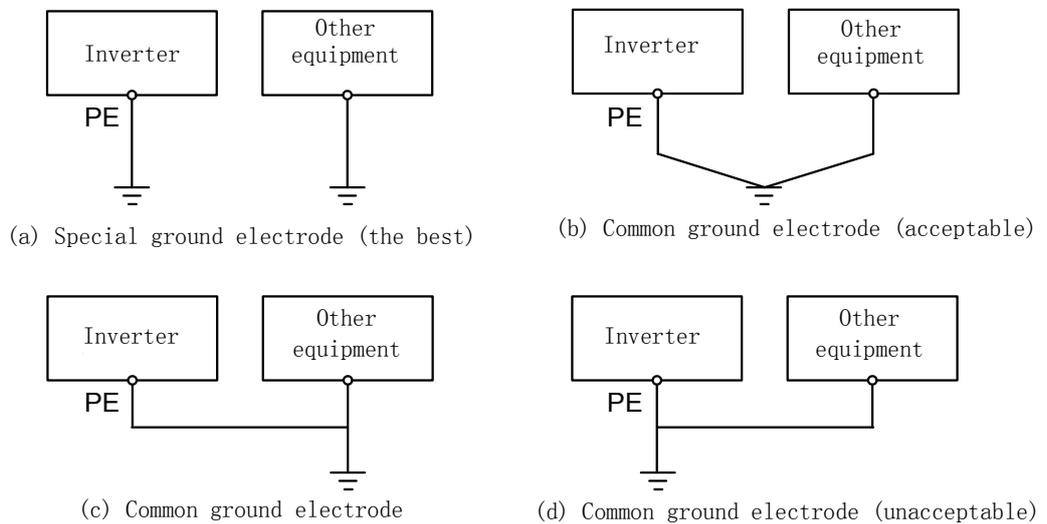


Fig. A-6 Diagram for special grounding

Method (a) is the best grounding method in above 4 connections. It is strongly suggested for users to adopt this grounding method.

A.3.2 Precaution for Ground Wiring

1) Grounding cable must be selected to have a standard cross section in order to minimize the grounding impedance. Flat cable has less high-frequency impedance than round conductor cable, flat cable is better in this case if they have the same cross section area.

2) To have grounding cable as short as possible, and grounding spot should be connected to inverter as close as possible.

3) If motor takes 4-core cable, one core must be grounded at inverter side. Other end is connected to the motor grounding terminal. The best grounding solution is that both motor and inverter have their individual ground electrode.

4) If all grounding terminals of different parts in control system are connected together, noise may be created because of ground current leakage. It may affect the peripheral devices other than inverter. In the same control system, grounding for inverter and other weak current devices, such as computer, sensor or audio device, should be wired separately.

5) In order to acquire low high-frequency impedance, all equipment fix bolts can be taken as high-frequency terminal to connect the cabinet back panel. Be aware to remove insulating paint before installation.

6) Grounding cable should be laid away from the I/O wiring of noise sensitive device, and should keep short.

A.4 Surge Absorber Installation

Relays, contactors and electromagnetic brakes can create large amount of noise. Surge absorber needs to be installed even those components aren't inside the inverter case. Wiring is shown in Fig. A-7.

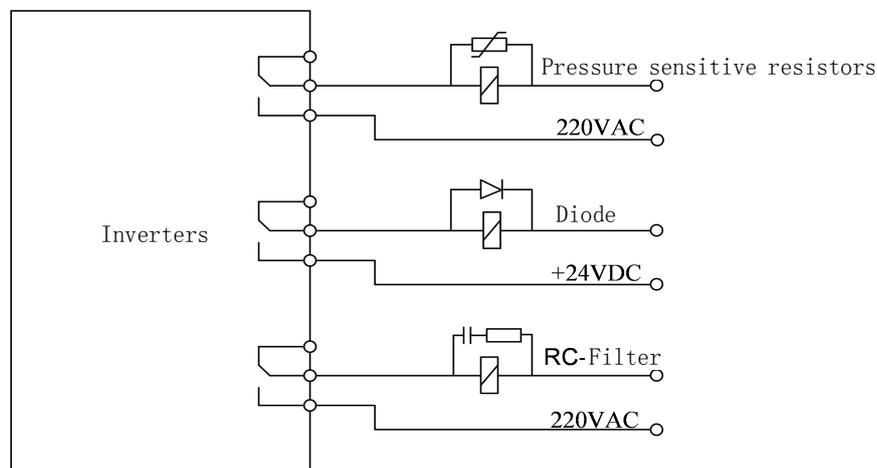


Fig. A-7 Requirement for relay, contactor, EM brake

A.5 Leakage Current and Its Solution

Leakage current flows through the linear capacitor and motor capacitor at input/output side of inverter. Current as shown in Fig. A-8, includes ground leakage current and interline leakage current. The amount of leakage current is decided by the size of carrier frequency and capacitance.

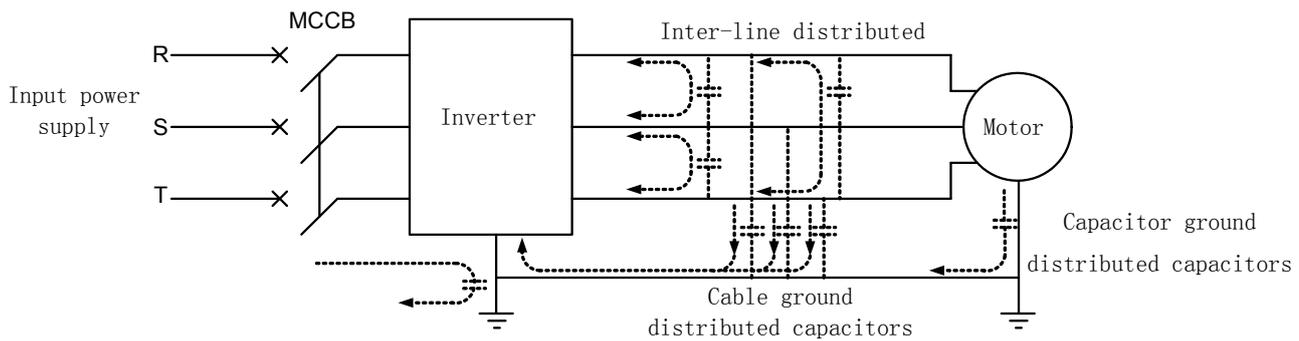


Fig. A-8 Leakage current path

A.5.1 Ground Leakage Current

Besides inverter, ground leakage current can also flow into other devices by grounding cable. It might trigger the wrong action of leakage current breaker, relay or other devices. The higher the inverter carrier frequency, the longer the motor cable is, the higher the leakage current will be.

Suppression measure: lower carrier frequency; short motor cable, take special designed leakage breaker for ultraharmonics/surge.

A.5.2 Cable Inter-line Leaking

The leakage current flowed through distributed interline capacitors at inverter output side, may trigger the wrong action of external thermal relay due to its ultraharmonics. Especially for small inverter which capacity is below 7.5 KW, the long cable (more than 50m) causes increasing leakage current. External thermal relay is easy wrongly triggered.

Suppression measure: lower carrier frequency; install AC output reactor at output side; recommend to use temperature sensor and monitor the motor temperature directly, or to use electronic thermal relay for motor overload protect carried by inverter to replace external thermal relay.

A.6 Radiation Suppression

Normally inverter is installed in a metal cabinet. Only minor radiation may affect the devices outside the metal cabinet. The main radiation source is the power cable connected externally. Since all inverter power cable, motor cable, control cable and keyboard wire need to be wired to outside of shielded cabinet, the outgoing position should be special handled, or shield will be invalid.

In Fig. A-9, part of cable inside the shielded cabinet plays as antenna. It picks up noise radiation in the cabinet and transmits to the outside air via cable. In Fig. A-10, wiring cable shielded layer to cabinet grounding at the outlet, noise radiation picked up in the cabinet will then flow into the earth directly via shielded cabinet, and will not affect the environment.

By using shielded layer grounding introduced in Fig. A-10, the place where cable shielded layer connects to the grounding cabinet should be close to the cable outlet, otherwise the unshielded cable between grounding point and outlet will still be functioned as antenna and have coupling affection. The distance between grounding point and outlet should be less than 15cm, the short, the better.

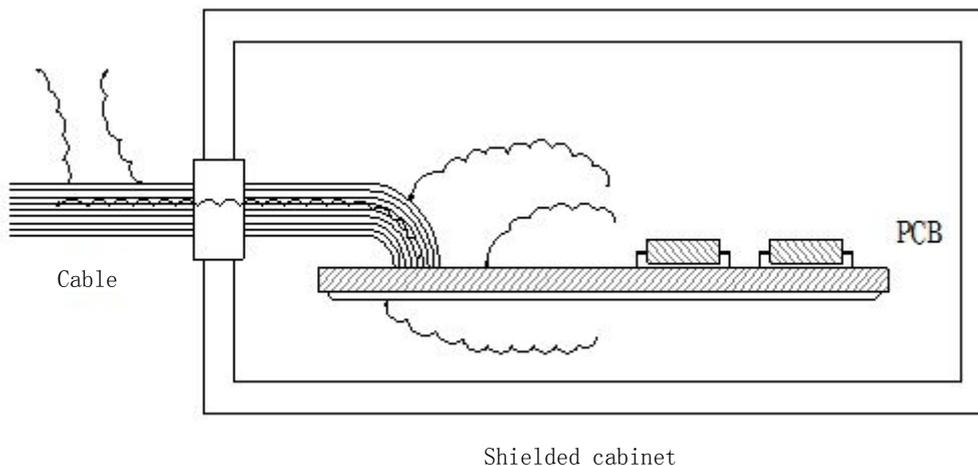


Fig. A-9 Radiation brought by cables from shielded cabinet

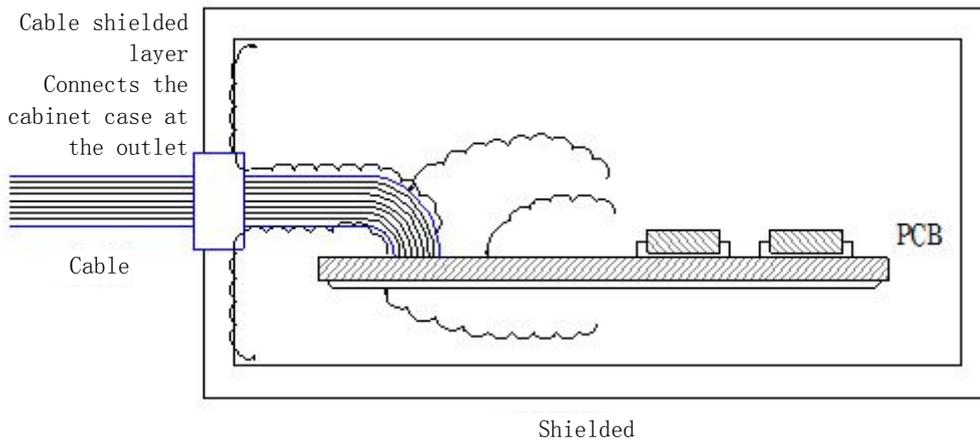


Fig. A-10 Cable shielded layer connects to shielded cabinet and suppress the radiation

A.7 Power Cable Filter Guide

Devices which create strong interference or are sensitive to surrounding interference can use power cable filter.

A.7.1 Function of Power Cable Filter

1) Power cable filter is a dual low-pass filter, it allows only DC and current with 50Hz. High frequency electromagnetic interference current is not allowed to pass. It can not only suppress electromagnetic interference created by device itself into the power cable, but also prevent interference on power cable into the device.

2) Power cable filter can meet both criterion for conduct emission and conduct susceptibility EMC. It can suppress the radiation interference at the same time.

A.7.2 Precaution for Power Cable Filter Installation

1) In cabinet, filter should be installed to the inlet of power cable as close as possible. The filter power cable inside the cabinet should keep short.

2) If filter input and output cable are laid to close, high frequency interference will bypass the filter and start to couple directly. Power cable filter will lose the function.

3) Normally, there is a designated grounding terminal on filter enclosure. If only one conductor is used to connect filter grounding terminal to the cabinet, filter will not be properly functional due to the high frequency impedance of long conductor. The correct way is to attach the filter enclosure to the metal conductive surface of cabinet and possible keep the large contact area. Note to remove insulating paint, ensure good electrical contact.

A.8 Installation Section Divide for EMC Inverter

In the driving system consist of inverter and motor, inverter and the peripheral devices, such as controller, sensors, are normally installed in the same cabinet. Control cabinet can suppress the outside interference by taking measures at the main conjunction. Therefore radio noise filter and input cable AC reactor should be installed at input cable terminal in control cabinet. To meet the EMC requirement, Electromagnetic Compatibility (EMC) should also be fulfilled inside the cabinet.

In the driving system consist of inverter and motor, inverter, brake unit and contactors are all sources of high noise intensity. It will affect the noise sensitive peripheral devices, such as automation equipments, encoder and sensors. Based on their electrical characteristics they can be installed in different EMC zones. The most effective measure to reduce interference is to separate the noise source and noise receiver in space. Fig. A-11 shows the division of inverter EMC installation zone.

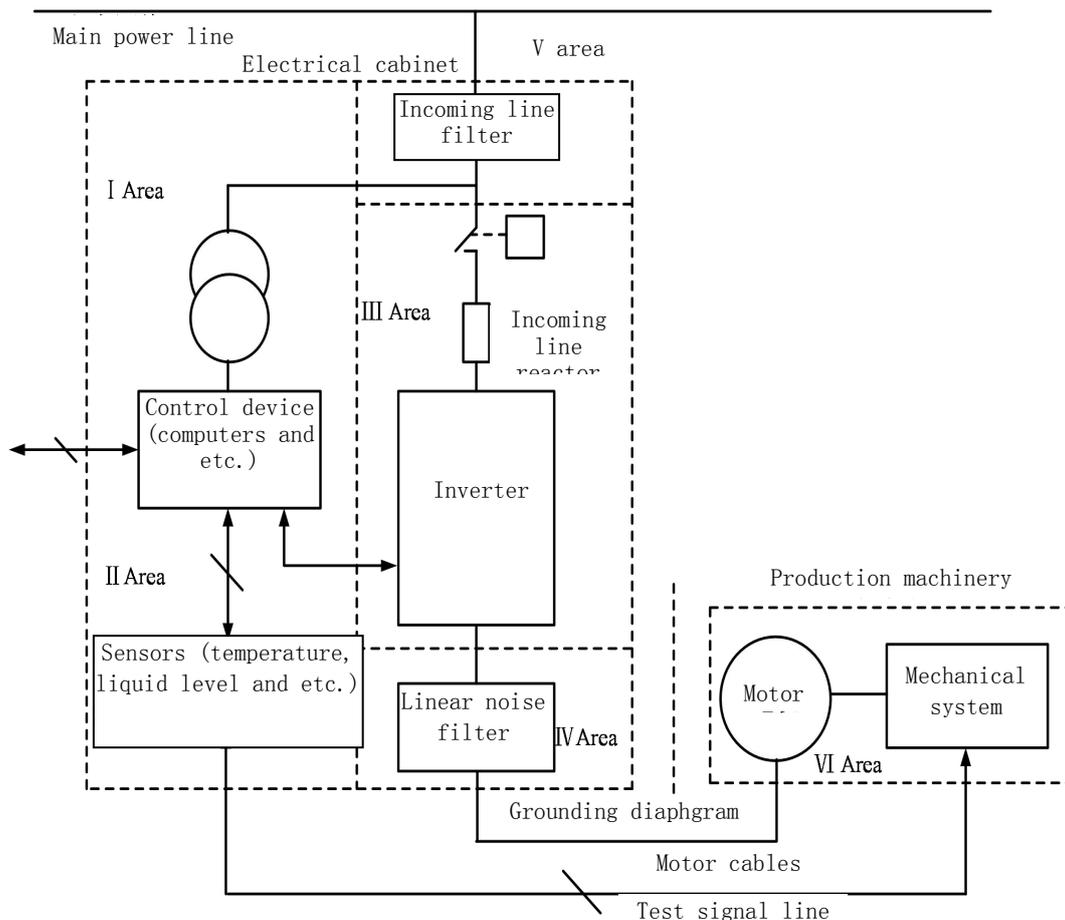


Fig. A-11 Diagram for inverter EMC installation zone

Above installation zones are described as follows:

Zone I: control power transformer, control device, sensors and etc.

Zone II: control signal cables and their connection, require certain ability for anti-interference

Zone III: major noise source includes incoming cable reactor, inverter, brake unit, contactors etc.

Zone IV: Output noise filter and its wiring

Zone V: Power supply (include wiring of radio noise filter)

Zone VI: Motor and its cable

Each zone must be separated and keep a minimum 20cm distance to avoid electromagnetic coupling. The grounded separator is the best to divide each zone for coupling. Cables in different zones should be inserted into individual cable ducts. When filter is required, it should be installed at entrance point of each zone. All bus cables (such as RS485) and signal cables from cabinet must be shielded.

A.9 Precaution for Electrical Installation

Fig. A-12 shows the inverter electrical installation.

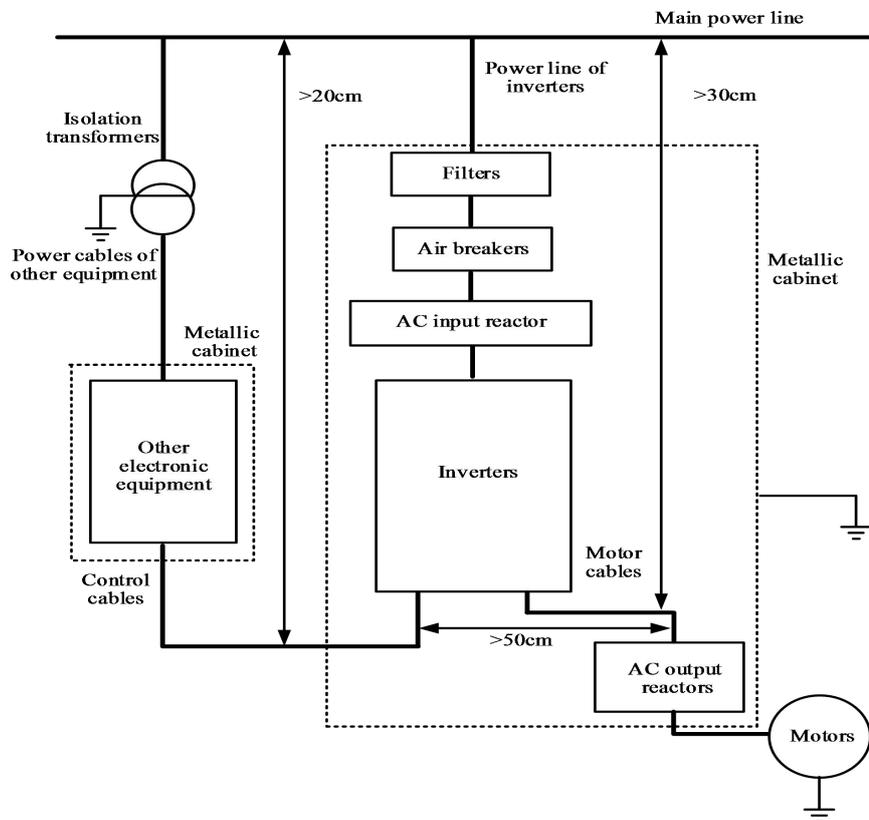


Fig. A-12 Inverter electrical installation diagram

To satisfy requirement of EMC, please note during installation:

1) Inverter should be installed inside the cabinet. Enclosure of devices, such as inverter back panel, input filter enclosure, all must be installed on the back of control cabinet firmly, and ensure having good electrical contact between them; to minimize the space between inverter and filter, a space less than 15cm can maximum reduce the grounding cable high frequency impedance between inverter and input filter, reduce high frequency noise.

2) At entrance of control cabinet (not more than 5 cm from the outlet) installs a wide grounding block. To ensure a good electrical contact, all input, output cable shielded layers should be connected to the grounding block and fixed by 360° ring type clamp.

3) Motor cable must use shielded cable, and the best to have metal interlocked conduit, or double layers of metal mesh shielded cable. The 360° ring type clamp (such as Fig. A.4) must be used as metal cable clamp to fix the shielded layer of motor cable

at inverter side to the back board of cabinet. There are two fixing locations: one is to close the inverter (the best is less than 15 cm), other location is to fix it on the ground block. 360° ring type connection should be taken to connect the motor metallic case when shielded layer of motor cable goes through the motor terminal box at motor side. If this type of connection is hard to do, the shielded layer can be braided, stretched and connected to the motor ground terminal. The stretched width should be greater than 1/5 of the braid length. The length of motor cable core and cable from PE flexible pipe should be as short as possible. The best is to keep it less than 5 cm.

4) Shielded cable must be taken for terminal block control cable. Its shielded layer should be connected to the ground block at the cabinet entrance and taken 360° ring type metal clamp. At inverter side shielded layer can be fixed on inverter metal case by using metal cable clamp. If that way is difficult to use, the shielded layer can be woven to a broad and short braid, and connect to the PE terminals after stretched. The best length of cable core and cable from PE flexible pipe should keep less than 15 cm.

5) Keyboard cable can't go out of the shielded cabinet.

6) The holes or seams on shielded cabinet should keep small and not more than 15cm.

A.10 EMC Standard Fulfilled by AS180 Series Inverter

AS180 series common vector inverter can meet the EMC standard as shown in Table A-2 after installing proper I/O filter, AC reactor (refer to the ACCESSORIES SELECTION for the proper type of filter and reactor) and following above mentioned wiring precautions.

Table A-2 AS180 series common vector inverter EMC performance summary

Item	Criteria	Level of satisfying criteria
Conducted harassment emission	EN12015.1998	0.15≤f<0.50MHz, 100dB(μv/m) ——Quasi-peak valu 0.50≤f<5.0MHz, 86dB(μv/m) ——Quasi-peak valu 5.0≤f<30MHz, 90~70dB(μv/m) ——Quasi-peak valu
Radiated harassment emission	EN12015.1998	30≤f<230MHz, 40dB(μv/m) ——Quasi-peak valu 230≤f<1000MHz, 47dB(μv/m) ——Quasi-peak valu
Electrostatic discharge immunity	EN12016.2004	Criteria B (contact discharge 4000V, air discharge 8000V)
Radiated electromagnetic field immunity	EN12016.2004	Level 3 Criteria A(3V/m)
Electrical Fast Transient (EFT) Immunity	EN12016.2004	Level 4 Criteria B (heavy current end ±2KV/2.5kHz)

Surge immunity	EN12016.2004	Criteria B($\pm 1KV$)
Conducted immunity	EN12016.2004	Criteria A(3V,0.15~80MHz)

Appendix B Standard Compatibility

(1) European Low Voltage Directive

AS180 series inverter complies with the standard of EN61800-5-1:2007, and its clause of Low Voltage Directive 2006/95/EC.

This inverter complies also the following standard:

EN61800-5-1:2007: Adjustable speed electrical power drive systems –Part 5-1: Safety requirements-Electrical, thermal and energy.



(2) European EMC Regulations

AS180 series inverter meets the following EMC standards once you start to install the product according the recommendation provided by this handbook.

EN12015.1998 Electromagnetic compatibility-Product family standard for lifts, escalators and passenger conveyors-Emission.

EN12016.2004 Electromagnetic compatibility-Product family standard for lifts, escalators and passenger conveyors-Immunity.

EN61800-3:2004: Power Drive Category D3.



(3) ISO9001 Quality Management System

Shanghai Sigriner STEP Electric Co., Ltd executes the quality management according the standard of ISO9001.

Appendix C Modbus Communication Protocol

The inverter whose Modbus address is set as hexadecimal number system:

Modbus address of register = register address + 0x999A

Modbus address of register bit = register address*16 + bit No. n (n=0... 15)

Modbus address of inverter parameter = parameter No. expressed in hexadecimal
(for example, Modbus address of P10.23: 0x1023)

The inverter whose Modbus address is set as decimal number system:

Modbus address of register = register address + 10000

Modbus address of register bit = register address*16 + bit No. n (n=0... 15)

Modbus address of inverter parameter = parameter No. expressed in decimal (for example, Modbus address of P10.23: 1023)

C.1 Command Data [registers 3 and 6] [bits 1 and 5]

Read the register in this table with function code 3, write the register in this table with function code 6

Read the bit in this table with function code 1, write the bit in this table with function code 5

Register address	Contents
0000H	Communication control word bit0 1: FWD 0: invalid bit1 1: REV 0: invalid bit2 1: run 0: stop bit3 reserved (1: with external fault) bit4 1: reset fault command bit7~5 reserved (multi-speed selection # attached table Z-1) bit8 reserved (1: valid inching frequency #) bit10~9 acceleration and deceleration time selection 0: curve 1 1: curve 2 bit11 reserved (1: lockout base #) bit12 1: select running and given command 2 0: select running and given command 1 bit13 1: select PID parameter group 2 0: select PID parameter group 1 bit15~14 not used*
0001H	Modbus target frequency given value, communication given value 0~30000: 0.00~300.00Hz
0002H	Reserved (Modbus current frequency given value) IQ10(1.0): rated frequency
0003H	Reserved (Modbus PID given value) 10000 corresponds to 100% given quantity

0004H	Reserved (Modbus PID target value validity 1: valid 0: invalid)
0005H	Reserved (AO1 output value) -1024~1024: -5.00~5.00V
0006H	Reserved (AO2 output value) -1024~1024: -5.00~5.00V
0007H	Multifunctional port output# bit0 1: DO0 (relay A) ON 0: OFF bit1 1: DO1 (relay B) ON 0: OFF bit2 1: DO2 ON 0: OFF bit3 1: DO3 ON 0: OFF bit4 1: DO4 (OC) ON 0: OFF bit5 1: DO5 (OC) ON 0: OFF bit6 not used bit7 not used bit15~8 not used <i># actual terminal output value = Modbus set value internal output value of function terminal</i>
0008H	Reserved (validity of Modbus broadcast data) bit0 1: valid Modbus broadcast given of terminal DI0 0: invalid bit1 1: valid Modbus broadcast given of terminal DI1 0: invalid bit2 1: valid Modbus broadcast given of terminal DI2 0: invalid bit3 1: valid Modbus broadcast given of terminal DI3 0: invalid bit4 1: valid Modbus broadcast given of terminal DI4 0: invalid bit5 1: valid Modbus broadcast given of terminal DI5 0: invalid bit6 1: valid Modbus broadcast given of terminal DI6 0: invalid bit7 1: valid Modbus broadcast given of terminal DI7 0: invalid bit8 not used bit9 not used bit10 1: valid target frequency broadcast given value 0: invalid bit11 1: valid current frequency broadcast given value 0: invalid bit12 1: valid running command broadcast given value (FWR, REV, start, stop) bit15~13 not used
0009H	Reserved (target frequency broadcast given value)
000AH	Reserved (current frequency broadcast given value)
000BH	Reserved (running signal broadcast given value) bit0 Modbus broadcast given value # of terminal DI0 (the corresponding specific function is set by the parameter) bit1 Modbus broadcast given value # of terminal DI1 (the corresponding specific function is set by the parameter) bit2 Modbus broadcast given value # of terminal DI2 (the corresponding specific function is set by the parameter) bit3 Modbus broadcast given value # of terminal DI3 (the corresponding specific function is set by the parameter) bit4 Modbus broadcast given value # of terminal DI4 (the corresponding specific function is

	<p>set by the parameter)</p> <p>bit5 Modbus broadcast given value # of terminal DI5 (the corresponding specific function is set by the parameter)</p> <p>bit6 Modbus broadcast given value # of terminal DI6 (the corresponding specific function is set by the parameter)</p> <p>bit7 Modbus broadcast given value # of terminal DI7 (the corresponding specific function is set by the parameter)</p> <p>bit8 not used</p> <p>bit9 not used</p> <p>bit10 1: FWD 0: invalid</p> <p>bit11 1: REV 0: invalid</p> <p>bit12 1: run 0: stop</p> <p>bit13 1: external fault</p> <p>bit14 1: reset fault command</p> <p>bit15 not used</p> <p><i># adopted value of the function input terminal = (Modbus broadcast value & broadcast given validity) actual input value of function terminal</i></p>
000CH~0018H	Reserved (broadcast data)
0019H	<p>Virtual input terminals</p> <p>bit0: virtual terminal X0</p> <p>bit1: virtual terminal X1</p> <p>bit2: virtual terminal X2</p> <p>bit3: virtual terminal X3</p> <p>bit4: virtual terminal X4</p> <p>bit5: virtual terminal X5</p> <p>bit6: virtual terminal X6</p> <p>bit7: virtual terminal X7</p> <p>bit8~15: reserved</p> <p><i>#actual terminal input value = Modbus set value input value of outer terminal</i></p>
001AH~0068H	<p>Reserved control word (79 spaces)</p> <p>001AH: communication given torque -1000~1000 → -100.0%~100.0% motor rated torque</p> <p>001BH: speed limit value 0~40000 → 0.00~400.00Hz</p>
0069H	<p>Parameter update request</p> <p>After the parameter is received from the inverter via Modbus, it is saved in its parameter image area.</p> <p>0x55: update the actual parameter in RAM by use of that in image area.</p> <p>0xAA: update the actual parameter in RAM by use of the default factory parameter.</p> <p>0: no update.</p> <p>[Note]: the unit is automatically cleared after every update.</p>
006AH~01F9H	Reserved (parameter)
01FAH~046FH	Reserved 630 spaces

C.2 Monitoring Data [register 4] [bit 2]

Read the register in this table with function code 4 and read the bit in this table with function code 2.

Register address	Contents
0470H	Status word of the inverter status bit0 1: with running signal 0: no running signal bit1 1: in service bit2 1: in zero speed bit3 1: in forward 0: in reverse bit4 1: normal power-on of the inverter 0: abnormal power-on of the inverter bit5 1: in lockout base bit6 not used bit7 1: in fault bit8 reserved (1: in fault retry) bit9 reserved (1: wrong parameter setting) bit10 1: in self-tuning bit11 1: request self-tuning bit15~12 not used
0471H	Detection status bit0 1: frequency detection LF, frequency \leq detection frequency bit1 1: frequency detection GF, frequency \geq detection frequency bit2 1: frequency detection EF, given and feedback frequency in detection frequency band bit3 1: speed arrive bit4 reserved (1: in analog signal given frequency command loss) bit5 1: in over-torque detection bit6 1: in undervoltage detection bit7 1: bus voltage greater than 85% rated voltage bit8 1: exceeding 5% rated current during running, exceeding 10% rated current during stop bit9 1: fault forecast bit15~10 not used
0472H	Reserved (given target frequency)
0473H	Current running frequency 5000 corresponding to 50.00Hz
0474H	Reserved (PID given value)
0475H	Reserved (PID feedback value)
0476H	Reserved (PID output value)
0477H	Reserved (PID proportional item)
0478H	Reserved (PID integral item)
0479H	Reserved (PID differential item)
047AH	Reserved (communication fault) bit0 1: communication overtime

	bit1 1: frame format bit2 1: CRC error bit3 1: data length error bit4 1: odd-even check error bit5 1: overload error bit6 1: illegal command bit7 reserved (manipulator communication fault) bit15~8 not used
047BH	Parameter updating status bit0 1: in updating 0: update completed bit1 reserved (1: data exceeding limit) bit2 reserved (1: data mismatched) bit3~15 not used
047CH~0484H	Not used (9 units)
0485H	Inverter output monitoring 1 bit0 1: normal power-on 0: abnormal power-on bit1 1: fault 0: normal bit2 1: running signal 0: no running signal bit3 1: frequency/speed arrive signal bit4 1: consistent frequency/speed bit5 1: in zero speed bit6 1: DC bus voltage greater than 85% rated voltage bit7 1: exceeding 5% rated current during running, exceeding 10% rated current during stop bit8 1: in self-tuning bit9 1: speed detection 1 bit10 1: speed detection 2 bit11 1: fault forecast bit12 1: self-tuning request
0486H	Reserved (inverter output monitoring 2)
0487H	Reserved (inverter output monitoring 3)
0488H	Reserved (inverter output monitoring 4)
0489H	Water pump output monitoring 1 bit0 1: water pump sleep bit1 1: motor 1 start bit2 1: motor 2 start bit3 1: motor 3 start bit4 1: motor 4 start bit5 1: motor 5 start bit6 1: motor 6 start bit7 reserved (Y8) bit8 reserved (Y9) bit9 reserved (Y10) bit10 reserved (Y11) bit11 reserved (Y12)

	bit12 reserved (Y13) bit13 reserved (Y14) bit14 reserved (Y15) bit15 reserved (Y16)
048AH	Water pump output monitoring 2 bit0 reserved (Y17) bit1 reserved (Y18) bit2 reserved (Y19) bit3 reserved (Y20) bit4 reserved (Y21) bit5 reserved (Y22) bit6 reserved (Y23) bit7 reserved (Y24) bit8 reserved (Y25) bit9 reserved (Y26) bit10 reserved (Y27) bit11 reserved (Y28) bit12 reserved (Y29) bit13 reserved (Y30) bit14 reserved (Y31) bit15 reserved (Y32)
048BH	Fault indication 1 bit0 module overcurrent protection bit1 ADC fault bit2 radiator overheat bit3 braking unit failure bit4 reserved bit5 reserved bit6 speed variation bit7 bus overvoltage bit8 bus undervoltage bit9 output phase loss bit10 motor low speed overcurrent bit11 encoder fault bit12 reserved bit13 reserved bit14 reserved bit15 motor phase sequence error
048CH	Fault indication 2 bit0 overspeed in the same direction bit1 overspeed in the opposite direction bit2 reserved bit3 encoder communication fault bit4 abc overcurrent

	<p>bit5 brake detection fault</p> <p>bit6 input overvoltage</p> <p>bit7 reserved</p> <p>bit8 reserved</p> <p>bit9 no self-learning of the encoder</p> <p>bit10 output overcurrent</p> <p>bit11 SINCOS encoder fault</p> <p>bit12 input phase loss</p> <p>bit13 overspeed protection</p> <p>bit14 motor high speed overcurrent</p> <p>bit15 grounding protection</p>
048DH	<p>Fault indication 3</p> <p>bit0 capacitor ageing</p> <p>bit1 external fault</p> <p>bit2 reserved</p> <p>bit3 reserved</p> <p>bit4 current sensor fault</p> <p>bit5 braking resistor short circuit</p> <p>bit6 too large instantaneous current value</p> <p>bit7 output contactor fault</p> <p>bit8 brake switch fault</p> <p>bit9 IGBT short circuit protection</p> <p>bit10 communication fault</p> <p>bit11 abnormal input power</p> <p>bit12 reserved</p> <p>bit13 reserved</p> <p>bit14 reserved</p> <p>bit15 reserved</p>
048EH	<p>Reserved (fault indication 4)</p> <p>bit15~0 reserved</p>
048FH	<p>Multifunctional terminal input status</p> <p>bit0 1: multifunctional terminal X0 ON 0: OFF</p> <p>bit1 1: multifunctional terminal X1 ON 0: OFF</p> <p>bit2 1: multifunctional terminal X2 ON 0: OFF</p> <p>bit3 1: multifunctional terminal X3 ON 0: OFF</p> <p>bit4 1: multifunctional terminal X4 ON 0: OFF</p> <p>bit5 1: multifunctional terminal X5 ON 0: OFF</p> <p>bit6 1: multifunctional terminal X6 ON 0: OFF</p> <p>bit7 1: multifunctional terminal X7 ON 0: OFF</p> <p>bit8 not used</p> <p>bit9 not used</p> <p>bit15~10 not used</p>
0490H	<p>Multifunctional terminal output status</p> <p>bit0 1: K1 ON 0: OFF</p>

	bit1 1: K2 ON 0: OFF bit2 1: Y0 ON 0: OFF bit3 1: Y1 ON 0: OFF bit4 1: Y3 (K3) ON 0: OFF bit5 1: Y4 (K4) ON 0: OFF bit6 not used bit7 not used bit15~8 not used
0491H	Feedback speed (Hz) -30000~30000 → -300.00~300.00Hz
0492H	Given speed -30000~30000 → -300.00~300.00Hz
0493H	Given speed filtering value
0494H	Output voltage effective value
0495H	Output current effective value
0496H	Output torque -1000~1000 → -100.0%~100.0% inverter rated current
0497H	Driver efficiency
0498H	Bus voltage
0499H	Analog input AI0/TM motor temperature detection input -10000~10000→-10.000~10.000V
049AH	Analog input AI1 -10000~10000→-10.000~10.000V
049BH	Analog input AI2 (reserved)
049CH	System time
049DH	Radiator temperature
049EH	Phase U voltage (instantaneous value)
049FH	Phase V voltage (instantaneous value)
0490H	Phase W voltage (instantaneous value)
04A1H	Phase U current (instantaneous value)
04A2H	Phase V current (instantaneous value)
04A3H	Phase W current (instantaneous value)
04A4H	Output active power
04A5H	Total output power
04A6H	Reactive power
04A7H	Power factor
04A8H	Feedback speed (rpm) -9999~9999→-999.9~999.9
04A9H	Pre-torque
04AAH~04B9H	Reserve 16 units
04BAH~04D9H	View[0~31]: The specific monitoring contents are related to the inverter model. Please refer to “select LCD display data content” in the Inverter Instructions. 04BAH: View[0]/no-definition 04BBH: View[1] 04BCH: View[2] 04BDH: View[3] 04BEH: View[4] 04BFH: View[5] 04C0H: View[6]

	04C1H: View[7] 04C2H: View[8] 04C3H: View[9] 04C4H: View[10] 04C5H: View[11] 04C6H: View[12] 04C7H: View[13] 04C8H: View[14] 04C9H: View[15] 04CAH: View[16] 04CBH: View[17] 04CCH: View[18] 04CDH: View[19] 04CEH: View[20] 04CFH: View[21] 04D0H: View[22] 04D1H: View[23] 04D2H: View[24] 04D3H: View[25] 04D4H: View[26] 04D5H: View[27] 04D6H: View[28] 04D7H: View[29] 04D8H: View[30] 04D9H: View[31]
04DAH~04E5H	Uxx monitoring data (curve data) 04DAH: U01 data value (curve 1) 04DBH: U02 data value (curve 2) 04DCH: U03 data value (curve 3) 04DDH: U04 data value (curve 4) 04DEH: U05 data value (curve 5) 04DFH: U06 data value (curve 6) 04E0H: U07 data value (curve 7) 04E1H: U08 data value (curve 8) 04E2H: low byte: U01 logo (curve 1 configuration); high byte: U02 logo (curve 2 configuration) 04E3H: low byte: U03 logo (curve 3 configuration); high byte: U04 logo (curve 4 configuration) 04E4H: low byte: U05 logo (curve 5 configuration); high byte: U06 logo (curve 6 configuration) 04E5H: low byte: U07 logo (curve 7 configuration); high byte: U08 logo (curve 8 configuration)
04E6H~04E9H	Reserve 4 units (for the driver)

04EAH~05E9H	Phase U current (buffer 256 points, for graphical display) [take sample once every 10 PWM periods]	
05EAH~06E9H	Phase V current (buffer 256 points, for graphical display)	
06EAH~07E9H	Phase W current (buffer 256 points, for graphical display)	
07EAH	Output torque (for graphical display)	
07EBH	Given speed (for graphical display)	
07ECH	Feedback speed (for graphical display)	
07EDH	Bus voltage (for graphical display)	
07EEH~09EDH	Reserve 512 spaces (for graphical display)	
0A34H~0A38H	Historical fault 0 (the earliest)	Fault code
		Actual speed at faulty moment -30000~30000→-300.00~300.00Hz
		Given speed at faulty moment -30000~30000→-300.00~300.00Hz
		Bus voltage at faulty moment
0A39H~0A3DH	Historical fault 1	Fault code
		Actual speed at faulty moment -30000~30000→-300.00~300.00Hz
		Given speed at faulty moment -30000~30000→-300.00~300.00Hz
		Bus voltage at faulty moment
0A3EH~0A42H	Historical fault 2	Function code
		Actual speed at faulty moment -30000~30000→-300.00~300.00Hz
		Given speed at faulty moment -30000~30000→-300.00~300.00Hz
		Bus voltage at faulty moment
0A43H~0A47H	Historical fault 3	Function code
		Actual speed at faulty moment -30000~30000→-300.00~300.00Hz
		Given speed at faulty moment -30000~30000→-300.00~300.00Hz
		Bus voltage at faulty moment
0A48H~0A4CH	Historical fault 4	Function code
		Actual speed at faulty moment -30000~30000→-300.00~300.00Hz
		Given speed at faulty moment -30000~30000→-300.00~300.00Hz
		Bus voltage at faulty moment
0A4DH~0A51H	Historical fault 5	Function code
		Actual speed at faulty moment -30000~30000→-300.00~300.00Hz
		Given speed at faulty moment -30000~30000→-300.00~300.00Hz
		Bus voltage at faulty moment
0A52H~0A56H	Historical fault 6	Function code
		Actual speed at faulty moment -30000~30000→-300.00~300.00Hz
		Bus voltage at faulty moment

		Current at faulty moment
0A57H~0A5BH	Historical fault 7 (the latest)	Function code
		Actual speed at faulty moment -30000~30000→-300.00~300.00Hz
		Given speed at faulty moment -30000~30000→-300.00~300.00Hz
		Bus voltage at faulty moment
		Current at faulty moment

Customer Complaint

Customer Name:	
Tel:	Fax:
Complaint Category: <input type="checkbox"/> Marketing <input type="checkbox"/> Publicity <input type="checkbox"/> Service <input type="checkbox"/> Quality <input type="checkbox"/> Business <input type="checkbox"/> Product <input type="checkbox"/> Others	
Complaints:	
The Complainant (Signature):	
Complaints Unit(Official Seal):	
Date:	

